The promise and limits of Web 2.0 tools for Communities of Practice

By

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Thesis presented in fulfilment of the requirements for the degree of Master of Philosophy (Information and Knowledge Management) in the Faculty of Arts and Social Sciences at Stellenbosch University

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March 2021

Declaration

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Summary

The thesis investigates the impact of Web 2.0 tools and technologies on Communities of Practice (CoPs) and the extent they are being used by Communities of Practice to promote the management of knowledge within organisations. The term Web 2.0 indicates the evolution of the Web from a static to a dynamic environment, allowing for more user participation and visibility in content creation.

In Chapter 2 an extensive literature review is undertaken of knowledge management. The knowledge-as-practice view can be distinguished from the knowledge-as-content and knowledge-as-process vies. The knowledge-as-practice view allows for the sharing of knowledge through collaboration in Communities of Practice.

Chapter 3 identifies the nature, scope as well as different types of Communities of Practice. Communities of Practice are usually informal groups of people that share a common practice and collaborate to create and share knowledge that is useful for that practice.

Chapter 4 is an exploration of the components that define Web 2.0 tools and technologies, and their use within organisations as described by Andrew McAfee in his book “Enterprise 2.0 New Collaborative Tools for your Organization’s Toughest Challenges”.

In Chapter 5, an analysis of how Web 2.0 tools and technologies is used by Communities of Practice to promote the sharing and/or creation of knowledge is undertaken.

The thesis comes to the conclusion that the emergent social software platforms of Web 2.0, allow for quick and easy connections across networks, improves content creation by normal users, and require very little to no training of users. In addition, the tools and technologies are free and deployed through the web, so there is no need for hardware and software to be updated and deployed within the organisation. In other words, Web 2.0 offers great promise to support knowledge management in Communities of Practice even though its adoption has been slow.

Opsomming

Die tesis ondersoek die impak van Web 2.0 instrumente en tegnologieë op praktykgemeenskappe (“Communities of Practice”) en die mate waartoe dit in sulke gemeenskappe gebruik word om kennisbestuur in organisasies te bevorder. Die term Web 2.0 dui op die evolusie van die web van 'n statiese na 'n dinamiese omgewing wat meer gebruikersdeelname in inhoudskepping moontlik en sigbaar maak.

Hoofstuk 2 beslaan ‘n uitgebreide literatuuroorsig oor kennisbestuur. Die kennis-as-praktyk perspektief kan van die kennis-as-inhoud en kennis-as-proses perspektiewe onderskei word. In die kennis-as-praktyk beskouing geskied die uitruil van kennis deur samewerking in praktykgemeenskappe.

Hoofstuk 3 identifiseer die aard, omvang, en verskeidenheid soorte praktykgemeenskappe. ‘n Praktykgemeenskap is gewoonlik ‘n informele groep mense wat 'n gemeenskaplike praktyk deel en saamwerk om nuwe kennis, wat bruikbaar is vir die praktyk, te skep en te deel.

Hoofstuk 4 ondersoek die komponente wat Web 2.0 instrumente en tegnologieë definieer, en die gebruik daarvan binne organisasies word aan die hand van Andrew McAfee se boek "Enterprise 2.0 New Collaborative Tools for your Organization's Toughest Challenges" beskryf.

Hoofstuk 5 bied 'n ontleding van hoe Web 2.0 instrumente en tegnologieë moontlik deur praktykgemeenskappe ingespan kan word om die bestuur van kennis te bevorder.

Die tesis kom tot die gevolgtrekking dat die opkomende sosiale sagtewareplatforms van Web2.0 voorsiening maak vir vinnige en maklike verbindings oor netwerke heen, verbeterde inhoudskepping vir gewone verbruikers, en min of geen opleiding van gebruikers vereis. Verder is Web 2.0 tegnologie gratis via die internet beskikbaar en is dit nie nodig om hardeware of sagteware in die organisasie te ontplooi nie. Met ander woorde, Web 2.0 bied groot belofte vir die ondersteuning van kennisbestuur in praktykgemeenskappe alhoewel opname traag blyk te wees.

Acknowledgements

Thank you to Mangosuthu University of Technology for the unwavering support given to me in undertaking and completing this thesis, and to my colleague and Head of Department Dr Vikash R. Jugoo for motivation and support. I would also like to thank my supervisor Dr Christiaan Maasdorp from Stellenbosch University for his mentorship, tolerance and faith in me.

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Chapter One:

Background

Real World Problem

Web 2.0 technologies hold great promise for practice-based conceptions of organizational knowledge. To date, technology that has been used has not made visible the process of interaction or exchange taking place, for example, which people viewed or contributed to an issue or downloaded a document from the database. Newell believes that Web 2.0 technologies enables interaction that supports knowledge in practice by making such exchanges visible (Newell,156-157). On first view, it looks like the Knowledge Management practice of Communities of Practice fits very well with Web 2.0 technologies, but the actual uptake in work environments have been very slow. It is unclear whether this has to do with the maturity of Web 2.0 technologies or with the nature of the practices it has to support in work environments. Some people (like McAfee and Newell et al) believe that Web 2.0 technologies if adopted within appropriate tools can enhance an organisations performance. The nature of communities of practice requires differentiation, as there are different types of communities of practice. The support that may be required by a community of practice may depend to a large extent on the nature and type of community of practice it is. Organisations may be reluctant to adopt Web 2.0 technologies as it means relinquishing some of their control over the structure of the organisation's intranet (Newell, 157).

Research Problem

To determine why the uptake has been slow, will require that the essential features of Web 2.0 technologies be uncovered, rather than focusing on extant technologies. Similarly, the nature of communities of practice and the types of communities of practice will be uncovered. To solve this issue, some differentiation is needed both in terms of the technology and the practices in organisations. The research puzzle posed, will require me to drill down to the essential features of Web 2.0 technologies. There are six essential features of Web 2.0 technologies as outlined by McAfee. In addition, the concept of communities of practice, a relatively new form of organizational structure, as well as the various types of communities of practice will be

examined in depth. An analysis of Web 2.0 technologies against the various types of communities of practice will be done to determine if and which of the Web 2.0 technologies can benefit which type of community of practice.

Research Objective

The thesis aims to demonstrate the promise and the limits of Web 2.0 technologies for providing material support for Communities of Practice (CoPs). Knowledge creation and sharing, promoting learning and innovation within organisations, sustaining competitive advantage are some reasons why communities of practice have been adopted by organisations (Anthony et al. 2009; Brown and Dugaid 1991; Swan et al. 2002). However, communities of practice are not prevalent in the business sector (Wenger, 2000). The growth of social networking has been phenomenal in the last decade, with people of all ages across the spectrum adopting and using Web 2.0 technologies embedded in social media platforms, like for example Facebook, Twitter, Wikipedia. If we can identify the features of Web 2.0 technologies, their limits and benefits, and match them to the correct type of community of practice for which they are most suited for, this may lead to a growth in communities of practice as well as in the activities of communities of practice. Perhaps communities of practice will be easier to support beyond face-to-face interaction.

Problem Statement

To determine the promises/limits of Web 2.0 in providing material supports for communities of practice. Online companies like Facebook, Twitter and Google have deployed Web 2.0 technologies very successfully for on-line social collaboration and to create search engines These websites have been embraced by people and have taken the world by storm as people ranging from professionals, housewives, students and scholars use devices ranging from desktops, laptops, iPads, tablets to cell phone devices, to connect with colleagues, friends, family or to search the internet for information required for work, school or private use. The features that have made Web 2.0 technologies so popular amongst social networks must be explored to determine the promises / limits that these technologies hold for communities of practice. The various types of communities of practice and the types of material support that can benefit these communities of practice need to be identified.

Sub-Problem 1

McAfee reports "knowledge workers use channels all the time and frequently visit both internal and external platforms (intranet and Internet). The channels, however, can't be accessed or searched by anyone else, and visits to platforms leave no traces. Furthermore, only a small percentage of most people's output winds up on a common platform. Thus, the channels and platforms in use aren't much good at providing answers to such questions as: What's the right way to approach this analysis? Does a template exist for it? Who's working on a similar problem right now? When our Brazilian operation reorganized last year, who were the key people? What are the hot topics in our R&D department these days? Indeed, it's probably safe to say that within most companies most knowledge work practice and output are invisible to most people. The good news is that new platforms have appeared that focus not on capturing knowledge itself, but rather on the *practices* and *output* of knowledge workers." (McAfee, Sloan Management Review, April 1, 2006).

Sub-problem 1 requires an in-depth investigation of Enterprise 2.0, the tools and technologies which include the 6 key features of Web 2.0, as identified by McAfee that is of interest to organisations and the work environment. These 6 key features identified by McAfee consist of search, links, authoring, tags, extensions and signals. These features need to be studied in great detail, in order to ascertain possible uses and / or identify current and new applications that could be developed in the future to enhance the work of knowledge workers. The benefits obtained by organisations with intranets or knowledge systems utilizing these key features will be determined.

Sub-Problem 2

Sub-problem 2 requires a thorough investigation of the various types of communities of practice that exists within organisations today and the type of material support needed by these communities of practice. The diversity present in communities needs to be established. The form and nature of a specific community may determine the type and amount of technological support that may be needed. With regards to the types of communities of practice, a starting point would be to explore the distinction between emergent communities of practice and managed communities of practice. Also, online communities have grown as communities have members that are global. Communities appoint their own leaders and need a lot of support from

senior management in terms of infrastructure and funding. The study of case studies, where communities of practice have been successfully implemented by companies like Fujitsu Services (then ICDL) with its own knowledge sharing intranet called VIK café and other similar success stories will be conducted to determine the infrastructure that contributed to that success. (John Pierce)

Theoretical framework

Newell: Knowledge as possession/practice

There is an entire branch of philosophy that deals with and debates the nature, origin, and scope of knowledge. In studies of knowledge work in organizational settings, 2 views of knowledge stand out. They have been referred to as the 'epistemology of possession' and the 'epistemology of practice' (Cook and Brown, 1999). Epistemology of possession views knowledge as something that people possess, whilst epistemology of practice views knowledge as something that people do.

With the epistemological view of knowledge as possession, knowledge is seen as a cognitive capacity, as a resource that can be developed, applied and used to enhance workplace efficiency. Those adopting this view often describe knowledge as a pyramid that consists of data, information, knowledge and wisdom (Ackoff, 1989). Knowledge is seen as the personal property of the individual, who is able to use his own subjective experiences, perceptions and previous understandings to give meaning to data and information. Nonaka speaks of 'tacit knowledge' that a person possesses through his own experience that can be converted into explicit knowledge and thereafter made available to others so that they may also 'know' without having gone through the same experiences (Nonaka, 1995).

The 'knowledge of practice view' as held by (Brown and Dugaid, 2001; Lave and Wenger, 1991) is based on the premise that knowledge is built through social construction and negotiation. Knowledge is linked to localized social situations and practices that people engage in, and not something that can stand outside of those practices. Their studies show that various occupations from construction engineers, photocopy technicians, radiologists, tailors, shipbuilders and alcoholics do not learn by converting tacit knowledge into explicit knowledge which is then transferred from one person to another (Brown and Dugaid, 2001; Lave and

Wenger, 1991). Rather they learn by sharing and creating all kinds of norms, stories, representations, tools and symbols, which enable the experience of individuals to be related to the knowledge of the wider community. In effect, knowledge is carried out through the practices of different groups and linked to the way that these groups work together and have developed shared identities and beliefs (Wenger & Snyder, 2000).

Wenger: Communities of Practice

Social networks may be seen as channels for the flow of knowledge between individuals and groups within an organisation, and across organisations. Social networks also act as communities, which tends to focus on the benefits of shared learning. The way that knowledge flows within a community of practice is largely influenced by their shape and structure (Newell, 2002). Newell states "From networks as communities' perspective, social networks are seen as providing a vital context for the creation and sharing of knowledge." (Newell et al., 168). Newell writes that social networks that operate primarily as channels have very different dynamics and effects compared to those that develop as communities. Channel type networks are better at sharing information but poor at sharing learning. Channel type networks are easier to establish, requiring some investments in time and resources to support social interaction and communications (Newell, 2002). Where social networks are seen as communities, the structure is less open, as members participation is intensive and dependent on shared identities. These types of communities take longer to grow as they depend on a much greater extent on a feeling of shared goals (Newell, 2002).

Etienne Wenger and Jean Lave introduced the term "communities of practice" in 1991. Communities of Practice refer to groups of people that are informally bound together due to their shared expertise and passion for a common interest. A community of practice may be a group of nurses that get together at lunch time to exchange stories of their nursing experiences, technicians that share their experiences on how to solve technical problems related to their job, or engineers engaged in deep water drilling (Wenger & Snyder, 2000). Some communities meet regularly whilst others connect mainly by email networks. People in communities of practice share their experiences and knowledge in free-flowing, creative ways that foster new approaches to problems (Wenger & Snyder, 2000).

Communities of practice have improved organizational performance at companies as diverse as an international bank, a major car manufacturer, and a U.S. government agency (Wenger and Snyder, 2000). It has been deployed by others from the Xerox PARC / Institute of Learning Research group (Dugaid & Brown, 1991). Communities of practice can drive strategy, generate new lines of business, solve problems, promote the spread of best practices, develop people's professional skills and companies recruit and retain talent (Wenger and Snyder, 2000).

The organic, spontaneous and informal nature of communities of practice makes them resistant to supervision and interference from management. However, some companies have overcome the managerial paradox and successfully nurtured communities of practice. Managers can assist communities of practice by bringing the right people together, providing an infrastructure that helps them to thrive, and measure their value using non-traditional means (Wenger and Snyder, 2000).

According to Newell, "there are several different views of what constitutes a community in existing studies" (Newell et al., 168). Emergent communities develop from the bottom-up through informal interactions within a particular social group, whilst formally defined groups established by organisations, often in a top-down way, to contribute to organizational performance are known as managed communities (Newell, 2002). The spread of many communities whose members interact mainly by using information systems and the internet are referred to as online communities. There may be elements of both emergent and managed forms within online communities and vice versa, but online communities are defined primarily through how they interact rather than the nature of their development (Newell, 2002).

Emergent communities research built on the initial concept of communities of practice as defined by Wenger and Lave (1991). They argued that knowledge is not just something that resides in a person's head; it is something that occurs out of the way that people interact in social groups, resulting in learning taking place (Wenger & Lave, 1991). Emergent communities start from the bottom up, lack usual forms of control and accountability, lacks deadlines. Emergent communities are important to individual organisations in order for them to learn and make knowledge a collective resource for the organisation, rather than the property of individuals (Newell, 2002).

In order to exploit the advantages of the emergent communities of practice, organisations have developed a more positive attitude, by accepting and providing support to communities or even developing new communities themselves. Some of these managed communities have evolved from existing emergent communities (Newell, 2002). Newell states that knowledge flows much more readily in horizontal peer-to-peer networks than in hierarchical structures as members see themselves on the same side, rather than as not equals when managers are introduced (Newell, 2002).

McAfee: Web 2.0/Enterprise 2.0

McAfee believes that new technology is significant because they can knit together an enterprise and facilitate knowledge work in ways that were simply not possible before (McAfee, 2006). He states that first, an understanding of the shortcomings of the technologies currently being used by knowledge workers is required, then an examination of how newly available technologies address these drawbacks be undertaken (McAfee, 2006). Current communication technologies being used are referred to as channels and platforms, with channels referring to email and instant messaging and platforms referring to intranets, corporate web sites and information portals. Whilst emails can be created and distributed by anyone, McAfee states that not everyone has access to view emails (McAfee, 2006). With platforms, McAfee reports that it is the opposite of channels, as content is generated or at least approved by a small group, but then is highly visible – production is localized, and commonality is high (McAfee, 2006). Knowledge management systems have sought to obtain tacit knowledge, best practices, and relevant experience from people throughout a company and make it widely available via a database. However, he states that Knowledge Management Systems did not even appear in a 2005 published survey of media used by knowledge workers (McAfee, 2006). McAfee indicates that many users are not happy with the channels and platforms available to them. McAfee states that Davenport's survey also revealed that whilst all knowledge workers used email, many were dissatisfied, as 26% of people felt that email was overused, 21% felt overwhelmed by it and 15% felt that it actually diminished their productivity (McAfee, 2006). He further elaborates that the Forester survey reveals that only 44% of respondents found it easy to find what they were looking for on their organisation's intranet. McAfee states that current technologies for knowledge workers are not doing a good job of capturing their

knowledge (McAfee, 2006).

Web 2.0 technologies refer to a collection of digital tools that are available on the Internet that enable the generation, sharing and refinement of information. These tools include Facebook, Twitter, blogs and wikis and facilitate social collaboration between people. These tools can add value within organisations especially where knowledge is seen as practice. McAfee, coined the phrase Enterprise 2.0 where he outlines the six features that is used in Web 2.0 technologies, that is of interest for work environments. McAfee uses the acronym SLATES to refer to these features, STANDING FOR search, links, authoring, tags, extensions and signals. Together these six features have the potential to make visible the practices and output of knowledge workers (McAfee, 2006). McAfee's research on Enterprise 2.0 culminated in the publishing of a book where he discusses the impact of social software platforms on business. McAfee identified the features of Web 2.0 technologies that will have a dynamic impact on business and has been regarded as the leading authority on that subject. Blogs, wikis etc. will transform the organisations intranet into a constantly evolving structure that is being built by distributed, independent workers and will show the way that work gets done. Enterprise 2. 0 are new tools that will facilitate creation, sharing and transfer of knowledge as people collaborate within the workplace (McAfee, 2006).

Method

The thesis will be done using conceptual research. I will unpack the key features of Web 2.0 technologies and match them with communities of practice in terms of nature and phase. A literature review will be undertaken on the aspects that follow. An overview of the distinction between knowledge as possession and knowledge as practice as per Sue Newell and associates will be explored. Thereafter the concept and origin of communities of practice as described by Wenger and Lave, including the impact on organisations, will be examined. The life cycle as well the different types of communities of practice will be determined. Thereafter, the key features of Web 2.0 technologies as defined by McAfee will be explored. Finally, the role of Web 2.0 technologies in communities of practice will be determined, by matching the key features to the different types of communities of practice and the type of support that they require. The results of this analysis can assist in bringing to light the larger role that Web 2.0 technologies can play in assisting communities of practice with their functions. In general, the

method and layout above represent a conventional strategy, commonly used in conceptual research study.

Demarcation/Scope

Assumptions

A first assumption is that communities of practice is not a fad but are here to stay. From the first introduction of the term communities of practice by Wenger and Lave in the early 1990s, there have been several major companies that have sought to introduce communities of practice within their organisations in order to stimulate growth and dissemination of knowledge, and thereby provide their organisations with greater savings, income and competitive edge. Whilst the term communities of practice have not become a household term, we can assume that communities of practice are here to stay due to the benefits that organisations have reaped from their existence.

A second assumption would be that communities of practice represent a reality that exists and makes use of information and communication technology. Whether a community of practice is restricted to the confines of an organisation with one physical location, or distributed over a greater geographical area, information and technology can be used by members for communication, collaboration and sharing of resources. Communities of practice members use channels in the form of email, or instant messaging to communicate with each other, as well as platforms like databases to store information to provide easy access to their members. With the new technologies like Web 2.0 that have emerged, communities of practice can benefit greatly, once these new technologies have been explored, and new possibilities arise for applications.

A third assumption would be that Web 2.0 technologies are not widely used in the work environment. Whilst Web 2.0 technologies have become very popular due to their use in social networks, use within the work environment has not been adopted at that same rate of acceptance. This provides me with the task of exploring why Web 2.0 technologies have not been adopted in organisations at the same pace as social networking platforms have adopted Web 2.0 technologies. I can explore the possibility that Web 2.0 technologies are not yet mature enough for adoption, or whether this is due to the nature of the practices employed by communities within organisations.

Delimitations

Research to be restricted to the examination of a few of the more popular social networking tools such as blogs, wikis, RSS feeds, search engine such as Google, Facebook, Instagram etc. and their use of key features from Web 2.0 technologies. This thesis is not an empirical study, but has a conceptual approach, as it is restricted to a review of research about key features of Web 2.0 technologies, communities of practice and the view of knowledge as practice. It is specifically restricted to people like McAfee, Lave & Wenger, Brown & Duguid, Cook & Brown and Newell. It is restricted to the view of knowledge as practice, which looks at knowledge creation, sharing and dissemination taking place within a social context. The belief is that tacit knowledge cannot easily be converted into explicit knowledge and transferred to others. Another limitation that has been adopted would be that knowledge creation and innovation that occurs within communities of practice are an expression of the knowledge as practice view.

The second delimitation would be to focus only on first level publications, that is those publications which purport to argue the concept extensively and perhaps provide an argued definition of the notion. Thus, casual or populist uses of the notion in secondary literature are excluded from this analysis. The large volume of publications in which the phrase "communities of practice" appears in, make it very difficult to do a thorough conceptual analysis. The research focuses on the meaning of the notion "communities of practice" as used in first level publications. The research does not try to engage in its own definition of the phenomenon of communities of practice. In other words, the unit of analysis is textual, not hypothetical. This thesis does not build theory but focuses on theory analysis.

Significance of Research

This research will assist in providing greater insight and understanding as to how the use of information and communication technology, specifically Web 2.0 technologies, can be used by communities of practice within the work environment. The successful use of Web 2.0 technologies by some organisations will be identified. This may allay fears that management often having of losing some of their control as employees are allowed to make greater input into the organisation's intranet with regards to content and structure. The adoption of these Web 2.0 technologies will have a beneficial effect. It may lead to increased growth and

satisfaction within communities of practice, possibly resulting in more gain for the organisation with regards to efficiency and knowledge creation and dissemination. The results of this study may also be of interest to other communities of practice such as non-profit organisations and non-governmental organisations or any community of practice that wants to incorporate the advances made in Web 2.0 technology to benefit their community.

Chapter 2:

Knowledge Management

Introduction

According to the Merriam-Webster online dictionary, knowledge is defined as "the fact or condition of knowing something with familiarity gained through experience or association" with an "acquaintance with an understanding of science, art, or technique". Knowledge has been viewed differently by various disciplines. In information technology, information is seen as the result of data that has been processed, and therefore becomes meaningful. The terms information and knowledge have often been used interchangeably. Data, information and knowledge have been viewed as having a hierarchical relationship with data representing facts, information representing the results of data that has been processed, and now has meaning. Knowledge is viewed as information that has more depth than data and is used to direct or carry out actions. In the field of knowledge management, knowledge is not equated as simply being facts or information. Knowledge is defined "in an area as justified beliefs about relationships among concepts relevant to that area" (Becerra-Fernandez, 2004: 13-14). This view of knowledge is supported within the literature (Nonaka, 1994).

Nonaka and Takeuchi believe that the miracle that occurred with the Japanese economy in the 20th century was because Japanese companies were willing to break from the past, dissolve fond attachments and innovate in order to gain competitive advantage. Nonaka and Takeuchi (1995) indicate that whilst American executives place great emphasis on explicit knowledge, Japanese executives valued tacit knowledge. Nonaka and Takeuchi (1995) coined the phrases tacit and explicit knowledge to differentiate between 2 different forms of knowledge. They defined explicit knowledge as knowledge that is formal, unambiguous, scientific, and falsifiable, whilst tacit knowledge refers to knowledge that is intuitive, bodily, interpretive, ambiguous, nonlinear and difficult to reduce to a scientific equation.

Types of knowledge

The modern world that we inhabit is powered by knowledge. Businesses today use knowledge to gain a competitive edge over their competition. Ikujiro Nonaka, examined the way organisations process knowledge and create knowledge, and reconceptualised the organisational knowledge creation process (Nonaka 1994). Traditionally, organisational theory, viewed the organisation as a system that solved problems and processes information, relied on a passive and static view of the organisation.

Organisations that deal with a changing environment, needs to process information efficiently, but will also have to create information and knowledge. The way an organisation interacts with its environment, how it creates and distributes information and knowledge, is essential to obtain a dynamic understanding of the organisation. (Nonaka, 1994). He cites innovation as an example of knowledge creation that information processing does not explain sufficiently. Innovation results from the organisation creating and defining a problem, and thereafter creating new knowledge to solve that problem. This innovation may have an effect on other parts of the organisation, resulting in more information and new knowledge being created, causing changes to the knowledge systems of the organisation (Nonaka, 1994). Nonaka's suggestion was that organisations should be looked at from the viewpoint of how information and knowledge was created, instead of how it was being processed within the organisation.

Information and Knowledge

The words Information and Knowledge are often used interchangeably, but there is a difference between the two terms. According to Machlup (1983), information refers to the flow of messages or meanings, which might improve, rearrange or change knowledge. Nonaka adopts a definition of Knowledge as "justified true belief" **(**Nonaka, 1994**).** Information can be viewed from both a syntactic and semantic perspective (Nonaka, 1994). Syntactic view as illustrated by Shannon's analysis of the volume of information, which is measured without consideration of the meaning of the information. A telephone bill for example would be analysed in terms of the duration of calls, and distance involved, and not the content of the telephone calls. Semantic perspective would look at the meaning of the information (Shannon and Weaver, 1949**)**. For the creation of knowledge, the semantic meaning of information has greater impact, as it refers to the communicated meaning.

Tacit knowledge vs Explicit Knowledge

Michael Polanyi (1966) stated "We can know more than we can tell". Knowledge that has been written down is a small fraction of all human knowledge. Polanyi categorised knowledge into two categories, namely tacit and explicit knowledge. Explicit or codified knowledge refers to knowledge that has been formalised by being written down and may be stored within books, archives, databases and libraries etc. Tacit knowledge has a personal quality to it, and may be difficult to express formally and communicated easily to other people. Tacit knowledge often involves actions, commitment and a specific context (Nonaka, 1994). Nonaka believes that Polanyi's idea of tacit knowledge can also include a practical aspect in addition to the cognitive element. This technical aspect of tacit knowledge includes crafts, skills within specific contexts, and concrete know how (Nonaka, 1994). Tacit knowledge is demonstrated by an individual when he engages in activities like swimming or cycling. It is often difficult to express exactly how one should cycle, without actually demonstrating the activity. Humans retain a lot of knowledge about activities they engage in, and are not always able to articulate this knowledge easily. This is tacit knowledge, and is not easily converted or codified into explicit knowledge.

Spreading personal knowledge is a key activity of a knowledge-creating company, and it occurs continuously at all levels of the organisation. It can also take many forms as seen by the example of the Matsushita Electric Company from Osaka, Japan. This company was developing a home bread maker, and was experiencing problems with the design. The bread baked by the machine had an overcooked crust, whilst the inside was uncooked. Despite numerous attempts at analysing the problem, product developers failed to find the solution, until a software developer named Ikuko Tanaka proposed that she train with a master baker at the Osaka International Hotel, which had a reputation for baking the best bread in Osaka. Tanaka spent time observing the master baker, imitating and practising. She realised that his kneading technique involved a distinct way of stretching the dough. After a year working with the project's engineers, and much trial and error, they were able to design special ribs inside the bread machine that recreated the baker's stretching technique. As a result they were able to successfully bake bread of the same quality as the master baker at the hotel. Matsushita's bread machine had record sales in its first year for a new kitchen appliance. This demonstrates how tacit knowledge held by the master baker was articulated into design specifications and thus

converted into explicit knowledge. The tacit knowledge held by the master baker is highly personal, hard to formalise and communicate to other individuals. After years of experience, a master craftsman can accumulate a dearth of experience, but is often unable to explain the technical or scientific principles underlying his knowledge (Nonaka, 1991).

Articulation, which is the conversion of tacit knowledge into explicit knowledge, and internalisation, which is the use of explicit knowledge to increase one's own tacit knowledge, are significant steps in the spiral of knowledge (Nonaka, 1991).

Knowledge is created by individuals, not organisations. However, support is given by the organisation to individuals to create knowledge which becomes part of the knowledge network within the organisation. Social interaction, which may be formal or informal assists in the new knowledge becoming transformed and legitimised (Nonaka, 1994). According to Nonaka, one way of implementing management of organisational knowledge is through the creation of "field" or self-organising team" whereby members collaborate to develop new ideas. The formation of such a team will enable members to voice their individual thoughts, resolve conflicts and improve their concepts through collaboration (Nonaka, 1994). The team activities can be broad and can also encompass customers and suppliers, as demonstrated by the close co-operation between Japanese part manufacturers and suppliers, where the suppliers are involved in the first stages of part development (Nonaka, 1994).

Modes of Knowledge Conversion

Nonaka postulated four modes of knowledge conversion, namely (1) from tacit knowledge to tacit knowledge, (2) from explicit knowledge to explicit knowledge, (3) from tacit knowledge to explicit knowledge, and (4) from explicit knowledge to tacit knowledge. Refer to figure 1.

	Tacit knowledge	Explicit knowledge
	To	
	Socialisation	Externalisation
Tacit knowledge		
From		
	Internalisation	Combination
Explicit knowledge		

Figure 1 Modes of Knowledge Conversion

The first mode of knowledge conversion is Socialisation, which involves interaction between individuals through shared experiences. An individual can learn from another individual by observing, copying and practising. This can even be done without the use of language. Apprenticeships or on the job training requires interaction between an apprentice and his mentor. The transfer of tacit knowledge from the mentor to the apprentice requires an experienced mentor, who is willing to guide the inexperienced apprentice, to acquire the necessary skills (Nonaka, 1994).

The second mode of knowledge conversion is Combination, and uses social processes like meetings, seminars, workshops and telephone conversations between individuals to combine explicit knowledge of individuals. This may result in the creation of new explicit knowledge through transforming of current explicit knowledge through means of sorting, adding, and analysing (Nonaka, 1994).

The mode of Internalisation deals with the conversion of explicit knowledge into tacit knowledge where an individual learns from explicit knowledge and internalises this knowledge so that it becomes tacit knowledge (Nonaka, 1994) .When new knowledge is shared within an organisation, other employees begin to internalise this new knowledge by broadening, extending and reframing their own tacit knowledge (Nonaka, 1995).

The mode of Externalisation allows for the process of tacit knowledge which is held by an individual to become explicit knowledge. The tacit knowledge can be made explicit by being articulated and documented into written format so that it can be available to other individuals (Nonaka, 1994). When Ikuko Tanaka was able to articulate the tacit knowledge she gained from the master baker, she converted it into explicit knowledge which she shared with her product development team (Nonaka, 1995).

Spiral of Knowledge

Nonaka proposed a Spiral of Organisational Knowledge Creation that depends on the dynamic interaction of all four knowledge conversion modes within the organisation. Whilst each of the four modes can result in new knowledge being created independently, interaction between internalisation and externalisation will result in the transforming of tacit knowledge to explicit knowledge and vice versa (Nonaka, 1994). He further indicates that interaction between all four modes of knowledge creation when managed by the organisation to form a continual cycle will result in organisational knowledge creation. The creation of knowledge within the organisation can be seen as an upward spiral, beginning at the individual level, going to the group level and finally reaching the organisation level, and even across organisations (Nonaka, 1994).

Knowledge as possession

The seventeenth century French philosopher Rene Descartes statement “Cogito ergosum” (I think therefore I am), is both a beginning and a conclusion for the traditional world’s epistemology of knowledge. It is the conclusion of Cartesians that the individual thinker is all important. It points to the “thinking self as being the one thing that we cannot doubt” (Cook and Brown, 1999). Cartesians maintain that it is through analytical reasoning, the influences of our senses and subjective impressions which may cloud our judgement can be minimised and

thus get our most reliable knowledge about the world (Cook and Brown, 1999). The starting point is provided by the enquiring mind that seeks to acquire new knowledge and is also seen as the repository of knowledge (Cook and Brown, 1999). This is the scientific method from which our conventional understanding of knowledge has been formed, where we see knowledge as something that is held in an individual's head. It is acquired, modelled and expressed in the most objective and explicit terms possible.

Cartesian tradition has had a strong grip on the exploration of explicit and tacit knowledge. Tacit knowledge is often treated as an obscure kind of knowledge, which must be made explicit in order for it to be understood or become useful. Cook and Brown (1999) argue that traditional epistemology has delayed the development of an understanding of explicit/tacit distinction that is wanted and being needed increasingly. Michael Polanyi's distinction on explicit/tacit is best illustrated through the example of a bicycle. People who claim to know how ride a bike, are unable to answer which way to turn the handlebar to avoid a fall to the left of right. Cook and Brown point out that people who can ride a bike must know how to stay upright and avoid falling, but they cannot explain how to do so. The knowledge about riding that they can articulate is known as the explicit dimension of knowledge. The knowledge they cannot express on how to keep upright and avoid falling by steering, is what Polanyi referred to as tacit knowledge (Cook and Brown, 1999).

Cook and Brown (1999) argue that tacit knowledge and explicit knowledge are two distinct forms of knowledge, with each form having its own purpose, may act as an aid to acquire the other form of knowledge, and cannot be converted from the one form into the other. A person who has not ridden a bike, will not be able to acquire the tacit knowledge using the explicit knowledge at his disposal. He can learn to ride only by getting onto the bike and acquiring the tacit knowledge. The explicit knowledge will act as an aid in possibly assisting him to keep upright (Cook and Brown, 1999). Cook and Brown argue that tacit knowledge does not get converted into explicit knowledge as the individual still retains the tacit knowledge even after acquiring the explicit knowledge and vice versa. They argue for a expanded view of knowledge as possession where the four types of knowledge are distinct from each other, and each can do work that cannot be done by the others (Cook and Brown, 1999).

Knowledge as practice

According to Cook and Brown(1999), not everything that people know can be categorised by the four forms of knowledge. The bicycle analogy showed that tacit and explicit knowledge alone is not enough for a person to be able to learn to ride a bike. The act of riding the bike is essential in contributing know how so that a person can learn to ride. Cook and Brown (1999) claimed that "the act of riding a bike does distinct epistemic work of its own", and is a part of human action, and not knowledge possessed by people. They refer to this as knowing and not knowledge. They further assert that knowing belongs to an "epistemology of practice" (Cook and Brown, 1999) Practice means to do and may involve doing something repeatedly in order to become competent or may involve exercising a competency such as a practising lawyer. The latter definition of practice involves "real work" such as a doctor, carpenter, tradesman etc. would engage in. John Dewey believed that the primary focus should be on concrete actions, and not on abstract concepts and principles. Dewey maintains that "knowing is literally something that we do", and not the knowledge that may underlie or be used in action. To be an accomplished engineer, requires much more than just an understanding of the engineering principles, it requires the ability to use that knowledge, and to also examine what it is that engineers do, and to be able to practice as an engineer. Knowledge must be viewed as "a tool at the service of knowing" and not as all that is required to facilitate action (Cook and Brown, 1999).

Knowing involves interaction with the social and physical world. Whilst knowledge is held within an individual, knowing also involves relations between the people and the world they interact in. Meaningful interaction requires that one honours the world they interact with. For example, a civil engineer, must work with the constraints imposed upon him by the strengths and limitations of the materials he uses in designing functional bridges. Failure to respect the materials he works with, will result in poorly built bridges that will collapse (Cook and Brown, 1999). Knowing is not superior to knowledge. Cook and Brown contend that the relationship between knowledge and knowing is dynamic and that each form of knowledge is brought into play, when knowledge is used as a tool when interacting with the world.

Structural Perspective to KM

Newell states that organisations believe that ICT drives organisational change, and that the use of ICT within the organisation will improve Knowledge Management processes. Organisations wishing to improve the flow and management of knowledge mainly use Knowledge Management Systems (KMS) and Enterprise Systems. KMS like email and intranets are used by individuals within organisations for the storage, searching of, and transfer of information and knowledge amongst each other (Alavi and Tiwana, 2003). Enterprise Systems embed industry best practices within software and are used to standardise and integrate work processes across a distributed organisation (Wagner et al., 2006).

The use of both these types of technology is frequently based on the epistemology of possession approach, in which knowledge is seen as a cognitive resource, as a possession that can be captured and shared amongst people through the use of ICT (Schultz and Leidner, 2002). Intranets are used as repositories, to store knowledge, and from where knowledge can be searched for and found. Alternatively organisations may rely on Enterprise Systems, which contains embedded knowledge, which may be the result of tacit knowledge having been converted into explicit knowledge. These structural KMS/Enterprise systems approaches have dominated above all else, due to the large size of organisations and their geographical distributions (Newell et al., 2002).

Enterprise Systems

Enterprise Systems is built on an epistemology of possession, and makes the assumption that best practices within an industry can be identified, captured and built into software and be used to standardise processes within organisations across that industry (Gratton and Ghoshal, 2005). Enterprise systems is trying to standardise control on how work is done by controlling the manner in which data is input and how data moves across a work process. Enterprise systems are marketed as knowledge management systems as organisations that adopt an Enterprise system will learn from very successful organisations by reorganising its workflows according to the work process models from the Enterprise System (Newell et al., 2002).

Enterprise Systems can be seen to be a modern descendent of Scientific Management.

Scientific Management developed by F.W. Taylor sought to develop the most efficient way of carrying out a task through transfer of knowledge from workers to management, so that management could devise the one most efficient way to execute that task. Henry Ford's Assembly Line production system sought to use knowledge from workers and automate car production. Taylors Scientific Management had negative effects on workers morale, as workers were expected to do tasks without any deviation or questioning of procedures. Similarly, American car companies lost market share as they failed to respond timeously to changes in demand from big vehicles to smaller energy efficient cars from consumers. In the same manner, restrictions on work and workers in Enterprise systems have also occurred.

Limitations of Enterprise Systems

Individuals often find ways around the restrictions imposed by Enterprise Systems as they enact rather than simply adopt an Enterprise System. Salespeople may only list the information that they want their superior or colleagues to know about, rather than list every sales contact as this will risk losing potential sales opportunities to their colleagues (Newell et al., 2002).

Another limitation revolves around a lack of consensus regarding what constitutes best practise given that organisations have different histories and cultures. Enterprise Systems does not take into account context, as organisations are encouraged to do a standard installation, rather than use the option of customising the Enterprise System to the organisation. Introduction of Enterprise Systems to manage knowledge work can face much opposition as people seek to get their current practises recognised as best rather than the standard practices of the Enterprise System (Wagner and Newell, 2004). In seeking to manage knowledge work, organisational flexibility which is needed for knowledge management may be curtailed. Galliers and Newell, 2003, argue that Enterprise Systems are not Knowledge Management systems, but rather Information Systems that provide information that enables experienced managers to use their knowledge of the context and processes to interpret the information correctly.

Knowledge Management Systems as a Repository

Knowledge Management Systems, KMS, also like Enterprise Systems, holds

the possession view that knowledge found within people's heads can be captured and processed using Information, Communication and Technology tools, so that it can be made available for use in new situations (Tseng, 2007). Knowledge Management is most often seen

as using of ICTs to transfer knowledge. Thus, surveys of companies introducing Knowledge Management initiatives are dominated by ICT implementations (Newell et al., 2002). Ruggles (1998) report on a survey of 431 organisations shows that the four most popular knowledge initiatives of intranets, data warehousing, decision support systems and groupware were all ICT related. Knowledge management systems have been categorised according to the knowledge processes that they aim to improve as Knowledge creation, Knowledge storage, Knowledge transfer and Knowledge (Alavi and Tiwana, 2003). Whilst, ICT has been useful for different knowledge management processes, Becerra Fernandez notes that storage and transfer technologies are the most popularly used KMS in practice (2004).

With regards to storage and transfer processes, two different types of KMS described by McAfee (2006) as 'platforms' and 'channels' and by Alavi (2000) as 'repository' and 'network' will be compared. The channel or network technologies, with the most popular being email, is used to share information from one individual to another individual or group of people. Where it is not known in advance, who will need the information in the future, the information is stored on a platform or repository such as the organisational intranet. People can then search for and retrieve the required information and knowledge when needed. The wide use of these ICT tools within organisations indicate that decision makers feel that ICT tools can benefit the capture, storage and transfer of knowledge. Whilst organisations have put much effort into putting content on the intranets for their employees (McAfee, 2006), research shows that users don't find it easy to locate the content they need from the intranet, with Davenport finding that only 44 percent of people finding it easy to locate content on the company intranet (2005). This research shows that people rely more on network technologies than the platform, showing the extent to which knowledge is a social activity involving collaboration in producing knowledge. However, Davenport found that 26%, 15% and 21% of people surveyed felt that email was over utilised, reduced productivity and were overwhelmed, respectively (2005).

One reason for limitations of KMS in organisations may be how KMS is perceived and used by people as part of their daily work practices. Also, some knowledge does not lend itself easily to being captured and made explicit. There are various reasons for this which include difficulty in expressing knowledge in written form, uncertainty of the knowledge, the fact that some knowledge is always changing, context dependent knowledge, cheaper to demonstrate than to

capture the knowledge, politics within the workplace. Moreover, people may not want to share their knowledge if that knowledge is a source of power and giving them personal advantages within the organisation (Newell et al., 2002).

Practice perspective to KM

According to Newell (2002), the epistemology of practice begins with the premise that truth, and therefore knowledge is contestable, and therefore cannot be transferred between people through ICTs in any simple manner. A version of the truth can be transferred but may not be accepted by the recipient given that there are alternative truths available. Knowledge or knowing cannot be separated from the beliefs and experience of the people using it. ICTs that have been marketed as KMS deny the socially constructed nature of knowledge. ICTs have promoted the belief that industry standards in the form of best practices can be encapsulated within software and adopted by a global organisation. Data can be easily transferred across channels, but the interpretation of that data will differ (Galliers and Newell, 2003). The knowledge as practice view emphasises the importance of social collaborations, shared understandings and attitudes that are necessary for knowledge to be created and shared (Kofman and Senge, 1993).

The Knowledge as practice view suggests that that is easier to share knowledge between individuals that have a similar practice, because they share a common understanding and belief system. Software professionals with similar training and understanding but coming from different countries will be able to collaborate because of their common understanding, whilst professionals with different training and / or different understanding may find it difficult to share knowledge. The development of social networking software such as MySpace, Facebook, Linked In, YouTube have facilitated social collaboration between people and thus assisted in creation and sharing of knowledge (Newell, 2002). These tools have collectively been referred to as Web 2.0, a term coined by Andrew McAfee. McAfee has called the use of social networking tools within organisations Enterprise 2.0.

The benefit of Web 2.0 is that the practices of knowledge management workers and knowledge production can be seen (McAfee, 2006). The Web 2.0 technologies make it possible to track changes in the form of who as well as what insertions, modifications and deletions have been

made (McAfee, 2006). The six elements that characterise Web 2.0 as described by McAfee are Search, Links, Authoring, Tags, Extensions, and Signals, otherwise known as SLATES an acronym coined by Andrew McAfee. A brief explanation of each of these characteristics is provided below:

- Search tools make it possible to search for information on any possible topic without compulsory navigation. Employees find it easier to find information on the global Internet than the intranet that their companies provide (McAfee, 2006). Navigation tools and structured layouts within the intranet do not make for ease of use compared to using keywords in search engines to find information (McAfee, 2006).
- Links makes it easy to view what related content and web sites people have looked at. McAfee believes that Google's search engine has a dense link structure that reflects changes over time and opinions of people (McAfee, 2006). This is unlike intranets within organisations that are built by small groups of developers and does not reflect frequent changes over time or the opinions of many people (McAfee, 2006).
- Authoring makes it possible for people to produce content, in the form of blogs, wikis, that can be read by others, and YouTube videos that can be viewed by other people. Anyone can be an author today. Wikis allow for group collaboration in the creation of content that is posted onto a web, whilst blogs allow for personal contributions. Blogs allow people to write about their knowledge, experience, express their opinions, state facts, provide links to related sites.
- Tags – the Forrester survey shows that after better search tools, people want better categorisation of content (Forrester survey, 2005). Some web sites collate large amounts of content and allow their users to provide tags. Tags are simple one-word descriptions of content. This practise allows the development of folksonomies, which is categorisation schemes developed by users of the web. Taxonomy is the traditional categorisation scheme that is developed by an expert, for e.g., the Dewey Decimal categorisation scheme used by the public library.
- Extensions allow for computers to allow do categorisation and pattern matching. Users likes/preferences for web sites and/or products are matched to other users with similar likes/preferences, recommendations are made on the basis that if "a user liked that, then they will like this" by extension (McAfee, 2006). Amazon has used pattern matching very

successfully to make recommendations to their customers based on others with similar taste.

- Signals. Despite the use of search engines and categorisation schemes, with the continued updates in sites of interest to users, users may find it difficult to keep up with the constant and frequent updates that take place (McAfee, 2006). Really Simple Syndication, better known as RSS feeds, allow the user to receive headlines that are links to content that they are interested in. Users can make use of special aggregator software that will search for updates in sites of interest, download them, and make available a list of headline links that the user can then access (McAfee, 2006).

KM Systems

Becerra-Fernandez (2004: 30) defines Knowledge Management (KM) at a simpler level "as doing what is needed to get the most out of knowledge resources" and can be applied to both individuals and organisations. An organisation may be a company, corporation, or a unit within a company or corporation. Knowledge refers to all current knowledge held by the individual and organisation, as well as new knowledge that could be obtained from other individuals and organisations (Becerra-Fernandez, 2004: 30).

According to Becerra-Fernandez (2004: 31) "Knowledge Management can be defined as performing the activities involved in discovering, capturing, sharing and applying knowledge so as to enhance, in a cost-effective fashion, the impact of knowledge on the unit's goal achievement". Becerra-Fernandez states that KM solutions can be achieved through KM processes, systems, information technologies, and infrastructure (Becerra-Fernandez, 2004).

Knowledge Discovery

New tacit or explicit knowledge can be created from existing data and information, or be synthesised from existing knowledge (Becerra-Fernandez, 2004). New explicit knowledge is developed through combination, where multiple bodies of explicit knowledge are synthesised to create new and more complex sets of knowledge (Nonaka, 1994). Existing knowledge may be viewed in a new configuration, new category or new context to arrive at new explicit knowledge (Becerra-Fernandez, 2004). Data mining may also be used to examine explicit data

and draw new relationships, which can eventually lead to the creation of new knowledge. New tacit knowledge is created Socialisation

Knowledge Capture

Knowledge can be found within individuals, groups, artifacts such as practices, technology repositories and within organisational units, within an entire organisation and across organisational networks. Knowledge may exist within a person as tacit knowledge, with the person sometimes not being able to articulate that knowledge to other people. Externalisation refers to process of converting tacit knowledge into external knowledge through the use of words, concepts, illustrations, or figurative language (Becerra-Fernandez, 2004). External knowledge may then reside within documents, manuals and books and other repositories like databases and intranets. External knowledge can be internalised by people into tacit knowledge through learning, actions, simulation or experiments. Thus, knowledge capture refers to the process of acquiring the tacit and explicit knowledge that resides within people, artifacts and organisations (Becerra-Fernandez, 2004).

Knowledge Sharing

Knowledge sharing takes place when explicit or tacit knowledge is transferred effectively from one or more persons to another person/s so that the person/s receiving the knowledge is able to comprehend the knowledge, make decisions and can act on the knowledge received (Jensen and Meckling, 1996). Sharing of knowledge is vital for an organisation to improve its innovation and performance. Sharing of tacit knowledge takes place through socialisation which involves interaction between people, whilst sharing of explicit information is known as exchange and can be done through the sharing of manuals, documents etc.

Knowledge Application

Knowledge is important in order for an organisation to make decisions and carry out tasks and thus knowledge has a direct effect on organisational performance. The processes of knowledge discovering, capture and sharing has a direct impact on the knowledge that is available to make decisions (Becerra-Fernandez, 2004). Knowledge can also be used without the person using it necessarily having an understanding of the knowledge. This can be done through direction and the use of routines. Direction involves a person being instructed to carry out an action by another person who has the knowledge. Routines use knowledge that have been incorporated into form of rules, procedures norms etc.

Knowledge management mechanisms facilitate KM and may be organisational, structural or social. KM mechanisms may not necessarily use technology. Internships, learning by doing and /or observation, face-to-face meetings, appointment of a chief information officer, rotating of staff across departments, collaborative projects across departments, initiation for new staff, organisational policies, standards are some of the KM mechanisms that are widely recognised and used (Becerra-Fernandez, 2004).

Knowledge Management technologies are an important part of and support Knowledge management systems. Some of the technologies that support KM are artificial intelligence, expert systems, computer based simulations, online discussion groups, decision support systems, management information systems, video conferencing, repositories using databases to store best practices and lessons learnt systems (Becerra-Fernandez, 2004, 36).

Knowledge Management Systems

"Knowledge discovery systems support the process of creating new tacit or explicit knowledge from data or information or from the synthesis of prior knowledge" (Becerra-Fernandez, 2004). Knowledge discovery systems support the two sub processes of combination and socialisation. Some of the mechanisms that support combination are collaborative problem solving, joint decision making and collaborative creation of documents. Mechanisms that encourage socialisation are apprenticeships, employee rotation across different areas, initiation process for new staff, brainstorming retreats, conferences, collaborative projects across departments (Becerra-Fernandez, 2004). Technologies like databases and online data access support combination whilst socialisation is supported by video conferencing and electronic support for communities of practice (Becerra-Fernandez, 2004).

Knowledge capture systems support the process of obtaining tacit knowledge, through internalisation, and explicit knowledge, through externalisation, that is present within people, artifacts and within organisational entities (Becerra-Fernandez, 2004). Knowledge can reside in employees, suppliers, clients, competitors and needs to be captured by these systems. KM

mechanisms and technologies enable knowledge capture through internalisation and externalisation.

Knowledge sharing systems support the process through which implicit and explicit knowledge is made available to other people (Becerra-Fernandez, 2004). These systems make use of mechanisms and technologies that support exchange of information through sharing of explicit knowledge, and socialisation, which allows tacit knowledge to be shared. Chat groups allow people to impart their knowledge to others through explanations and discussions. Mechanisms such as memos, manuals, documentation, reports, and presentations allows for exchange of explicit information to take place. Technologies that support exchange include groupware, online access to data, databases and repositories of information.

Knowledge application systems support the use of knowledge by individuals without these individuals having to acquire this knowledge (Becerra-Fernandez, 2004). Knowledge applications systems are supported by mechanisms and technologies that enable routines and direction. Traditional hierarchical relationships within organisations, help desks and support centres are mechanisms that support direction, whilst routines are facilitated through the mechanisms of policies, work practices and standards (Becerra-Fernandez, 2004). Technologies such as expert systems, decision support systems, and troubleshooting systems support direction, whilst routines are supported by enterprise resource planning systems, traditional management information systems, as well as expert systems (Becerra-Fernandez, 2004). Both the mechanisms and technologies can facilitate directions and routines both within and across organisations.

Knowledge Management Infrastructure

KM infrastructure is the foundation on which KM is built on and include the 5 components of organisational culture, organisational structure, communities of practice, information technology infrastructure and common knowledge (Becerra Fernandez, 2004).

Organisational culture

The organisational culture illustrates the norms and beliefs that guide the behaviour of the members within that organisation and is crucial for the successful adoption of knowledge management within an organisation. The factors that inhibit KM within an organisation are employees not having time for KM, employees not understanding KM and its benefits to the organisation, sharing of knowledge not being encouraged by the culture within the organisation, and not knowing how to measure the financial benefits of KM (Becerra Fernandez, 2004). Three of these factors are dependent on organisational culture.

An organisation culture that enables KM, would include employees having an understanding of KM, and understanding its value and benefit to the organisation. It would also have management that supports KM throughout the organisation, provides incentives to reward sharing of knowledge and to encourage creation of knowledge through greater interaction amongst employees (Armbrecht et al., 2001).

Organisational structure

The manner in which information flows and is shared within an organisation has depended largely on the organisation structure. A traditional hierarchical structure would see information flowing between a subordinate and his line manager, and limits the sharing of information. A more decentralised approach with a larger group of employees reporting to an individual would assist in greater interaction between individuals and a greater likelihood of sharing of information taking place (Becerra Fernandez, 2004). Knowledge Management can be facilitated within organisations through communities of practice. A community of practice is a self-organised group of individuals that could be from different units, across the organisation, and may be dispersed geographically, but communicate on a regular basis to discuss issues common interest (Lave and Wenger, 1991). A community of practice can be a group of engineers who work in different units, but meet on a regular basis, to discuss problems related to their area of expertise, or a group of nurses that meet over lunch to discuss their patients and their treatment thereof. Communities of practice provide a larger pool of expertise than what may be found within a department of an organisation, and consequently increase the chance of finding solutions to problems as knowledge is shared amongst the participants. Organisations

can also support KM through the appointment of a Chief Knowledge Officer and/or KM unit. The Chief Knowledge Officer would take charge of the unit and be responsible for promoting KM within the organisation. Research and Development unit, also a KM unit, is mainly concerned with managing of knowledge regarding new developments, whilst a corporate library acts as a repository to store past information about the organisation, the industry within which it operates, and the environment it competes in (Becerra Fernandez, 2004).

IT Infrastructure

Information Technology infrastructure consisting of hardware, software and communications technologies not only supports the information systems and management information systems within the organisation, but also supports KM. Daft and Lengel, 1986 views IT infrastructure in terms of reach, depth, richness and aggregation. Reach refers to the network and its access within the various geographical areas, with the ideal being a network that could reach anyone, anywhere. Depth refers to the detail and amount of information that can be conveyed over a network. This is dependent on the bandwidth of the network. Richness refers to the ability of communication channels to support both audio and video, provide quick responses, personalised messages and natural language (Daft and Lengel, 1984). Lastly, aggregation refers to the ability to store large amounts of information, which can then be mined to create new and valuable insights. These four capabilities support KM by improving common knowledge or enabling the 4 processes of KM.

Common knowledge

Grant, 1996, indicates that common knowledge is an important part of the infrastructure that supports KM. It also includes the accumulated experiences of the organisation in understanding knowledge and knowledge activities, as well as the underlying principles of communication and coordination (Zander and Kogut, 1995). Common knowledge also unites the organisation through a common language and vocabulary, shared norms, and possession of expertise knowledge within their specialisation, and acknowledging of individual knowledge areas (Nahapiet and Ghoshal, 1998).

Physical environment

The physical environment within the organisation plays an important role in facilitating the sharing of knowledge between individuals. The design and location of buildings, type of

offices, layout of work spaces, nature of meeting areas etc. all have an impact on interaction that can occur between employees. The physical environment can provide opportunities for employees to meet face-to-face and share ideas, and get help from one another. Becerra Fernandez (2004) indicates that informal meetings can take place at the water cooler, coffee room, cafeteria, or hallways, and hence, provide employees with the opportunity to learn from and share insights with each other.

Conclusion

Nonaka and Takeuchi defined tacit and explicit knowledge. Nonaka added onto Polanyi's idea of tacit knowledge to also include practical knowledge from skills, crafts and knowing how to do. People retain a lot of knowledge through the activities they engage in but are not always able to articulate this tacit knowledge. Nonaka's spiral of knowledge refers to the articulation and internalisation of knowledge. Nonaka described four modes of knowledge conversion, with the first mode being socialisation that is tacit knowledge to tacit knowledge. Tacit knowledge is demonstrated when a person engages in activities like swimming, riding a bike or when a master baker bakes bread. Knowledge involved in doing these tasks is difficult to articulate, and is not easily converted into explicit knowledge.

Cook and Brown argue for an expanded view of knowledge as possession, as knowledge is still retained, even after it is articulated and expressed in an explicit form. They argue that not everything can be categorised by the four forms of knowledge. One cannot learn to ride a bike using just the tacit and explicit knowledge available on the subject. The act of riding the bike itself is essential in contributing know how so that a person can learn to ride. This human action is referred to them as knowing and belongs to an epistemology of practice. Knowing involves interaction with the physical and social world.

KMS and Enterprise Systems are used within organisations to support KM processes. These systems use intranets and email for storage, searching and transfer of information. ICT is mainly used to support the epistemology of possession approach, which views knowledge as something that is possessed, can be captured and shared amongst people. Enterprise systems are often adopted by organisations seeking to standardise processes. Flexibility is often reduced, and the systems face much resistance from employees, who view their current

practices as best. The Davenport Report, 2005, showed that the majority of people find it difficult to locate information on intranets, and that people are overwhelmed with the amount of email received, and have found that productivity has dropped due to time spent on email.

The Davenport Report, 2005, showed that people preferred network technologies to platforms like intranets. This indicates that social collaboration is much more acceptable to people for sharing and creation of knowledge. The knowledge as practice view emphasises the importance of social collaborations, shared understandings and attitudes that are necessary for knowledge to be created and shared (Kofman and Senge, 1993). The Knowledge as practice view suggests that that is easier to share knowledge between individuals that have a similar practice, because they share a common understanding and belief system.

Chapter 3:

Communities of Practice

Introduction

The categorisation of knowledge as either explicit or tacit, has led to the development of "hard" IT driven KM systems, and "soft" learning or people driven KM mechanisms. The use of ICT systems to support KM has comprised predominantly of KM systems and Enterprise system. KM systems included the use of intranet and email. Enterprise systems was implemented by organisations in an effort to adopt best industry practices and was not always customised to meet the needs of the organisation, and often faced resistance from employees upon adoption. Communities of Practice are traditionally in the "soft" camp, the side that regards technology as an enabler and a tool to be used by CoPs for collaboration amongst members within an organisation and also across CoPs.

The modern world's economy runs on knowledge, and companies work hard to gain a competitive advantage from this. Cross-functional units, or business units that are focused on customers or products, are some of the commonly used organisational forms to share, capture and spread new ideas and knowledge (Wenger, 2000). Wenger indicates that a new organisational form, Communities of Practice (CoPs) has emerged. Communities of Practice will supplement existing organisation structures and drastically advance knowledge sharing, learning and change. Whilst the term "Community of practice is relatively new, the phenomenon it refers to is age-old", (Wenger, p1). According to Wenger (2000) "Communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly". He indicates that a Community of Practice (hereafter referred to as a CoP) can exist through a tribe learning to survive, a band of artists looking at new ways to express themselves, a group of engineers working on similar problems, a network of surgeons exploring novel techniques, a group of first-time managers helping each other cope (Wenger, p1). Wenger indicates that an increasing number of people and

organisations in various sectors are now using communities of practice as a means of improving their performance.

Communities of practice have had major impact on the performance of organisations in the last two decades. Some of these organisations range from an international bank, a major car manufacturer to a United States government agency (Wenger, 2000). Whilst the term CoP is new, CoPs have existed from decades if not centuries ago, in the form of apprenticeships, learnerships etc. CoPs have not become the norm despite its effectiveness, for several reasons namely, the term is relatively new, and the impulsive and relaxed nature of CoPs makes them unwilling to accept direction and intrusion (Wenger, 2000). Wenger notes however that several companies have successfully nurtured CoPs. Their managers have done this by bringing the right people together, providing the infrastructure to encourage CoPs to flourish, and measuring the benefits of CoPs to the organisation through unorthodox means.

CoPs are effective places for the creation and sharing of knowledge (Lave & Wenger, 1991). Such communities can keep dynamic and evolving knowledge within a real-time process that adds background to prevailing stationary repositories (Sharatt and Usoro, 2003). The members of the CoP identify with each other through the common language they speak, which is their shared expertise. A strong network of people with similar interests will result in a network of high levels of trust, shared behavioural norms and mutual respect (Lessor & Stork, 2001). This type of environment has been seen to possess high levels of social capital and has been associated with the processes to create and share knowledge (Nahapiet & Ghoshal, 1998).

Concept and Origins of COPs

Wenger defines Communities of practice as “groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly”. These would include groups of people informally bound together by shared expertise and passion for a joint enterprise such as engineers engaged in deep-water drilling, consultants who specialise in strategic marketing or frontline managers in charge of processing of cheques at a large commercial bank. Not everything known as a community is a community of practice. A neighbourhood is a community but is not necessarily a community of practice. A community of practice as defined by Wenger must be comprised of 3 crucial characteristics, namely the

domain, the community and the practice. The domain has its identity defined by a shared domain of interest. Membership means a commitment to the domain, and therefore a shared competence that distinguishes members from other people. A domain is not necessarily recognised as expertise outside the community.

In pursuing their common interests, members of a community will engage in joint activities and discussions, help each other, and share information. Members build relationships that allow them to learn from one another. Members of a community may not always work together on a daily basis. The Impressionists formed a community of practice as they used to interact with each other by meeting in cafes and studios to discuss the style of painting that they were creating together, yet they often painted in isolation. Members of a community of practice do not just have shared interests but are also practitioners. They develop and share resources such as experiences, stories, tools, and ways to solve recurring problems, in short, a shared practice. The development of this shared practice may be more or less self-conscious. Nurses that meet for lunch at the cafeteria on a regular basis and swap stories on patient care, learn how to care for patients from each other. They may not realise that their lunch discussions are one of their main sources of knowledge regarding patient care. On the other hand, an auto manufacturer makes an effort to document the tricks and lessons that they have learnt into a knowledge base.

Communities of practice are not always identified by this term within all organisations. They are known by different names, such as tech clubs, learning networks etc. Communities of practice have a variety of forms. Some communities are small, whilst others are quite large, often with a core group and a large number of peripheral members. Some communities are local, whilst others are global. Some communities meet face to face on a regular basis, say once a week for lunch, whilst others communicate online mainly through email or other means like videoconferencing. Some CoPs have an agenda, while others don't. Agendas if they exist, are not always followed rigidly, as CoPs operate in a relaxed manner, and may deviate from the agenda as they address other concerns raised by members. Members share their experiences, and knowledge in an open manner as they respond to problems being experienced, so that they can collectively help one another.

Why and Where CoPs are formed?

The Community of practice concept has found practical applications in business, government, education, professional associations, development projects and civic life. Wenger states that CoPs have been readily accepted by people in business because of the recognition that knowledge is a critical asset and must be managed strategically. CoPs provide a different approach to managing knowledge to that of information systems (Wenger, Article, Communities of Practice: a brief introduction). Communities of practice focus on people and social structures where members form relationships and learn with and from one another. Today, most organisations of a reasonable size have adopted some form of community of practice initiative (Wenger, 1998). CoPs are formed for various reasons and are as different as the situations that lead to their creation. A company may re-organise into team-based structures, leading to experts forming communities so that they can communicate and interact with their peers. External factors such as e-commerce, or alternatively internal factors like new company strategy may result in companies forming CoPs to deal with these new threats or opportunities.

Governments face increasing knowledge challenges and have adopted CoPs for similar reasons to organisations. However, with governments, the formality of bureaucracy can get in the way of sharing knowledge openly. Typical government problems of education, health, crime and safety require knowledge sharing across various levels of governments. In education, schools and districts also face increasing knowledge challenges. The first uses of community of practices have been in teacher training and in enabling school administrators who work in isolation to be able to interact with their colleagues. Professional associations are also looking for ways to focus on learning through contemplation of their practice. Communities of practice offer peer-to-peer learning activities as an alternative to the more traditional courses offered and publications (Wenger, 1998). Within civic organisations, there is also a growing interest in developing communities of practice among practitioners. “In the non-profit world, for instance, foundations are recognizing that philanthropy needs focus on learning systems in order to fully leverage funded projects” (Wenger, 1998).

Impact on and Importance of COPs to organisations

CoPs help drive strategy

In addition to lending money, the World Bank has chosen to become a knowledge bank and to be the forerunner in being able to provide high quality information and know-how to developing countries. The World bank has funded CoPs as its chosen means of pursuing knowledge management. Initially, although in existence for many years, the CoPs were small and disjointed, but have become the most important structure within the World Bank as the World Bank pursues its knowledge management strategy. There exists over 100 CoPs within the World Bank with intense participation from members due to the funding and infrastructure provided by the World Bank (Wenger, 2000).

Start new lines of business

Wenger puts forth the example of a group of marketing consultants who specialised in retail marketing within the banking sector. This group would meet regularly at the airport in between meetings with clients, where they would discuss new business opportunities for clients. The initially comprised of 5 to 7 consultants grew to 200 over a period of 4 years. They developed a new line of business aimed at the financial services companies. This CoP used their meetings to brainstorm and was able to develop a new line of marketing approaches with which they were able to penetrate the financial services sector.

Solve problems quickly

CoPs can help solve problems quickly. Members of a community can ask other members, who have the specific expertise, for help with a problem being experienced. The member will be able to express the problem in a way that his peers will be able to understand. For example, at Buckman Lab, members of the community respond on a regular basis to problems being encountered within 24 hours. A Buckman Labs employee was attempting to assist a pulp mill client from the Pacific North West to solve a dye retention problem. Within a day, several responses were received from community members based as far as Canada, Europe and South Africa. One of these responses was able to solve the problem being experienced by the pulp mill (Wenger, 2000).

Used to transfer best practices

A CoP is a perfect environment for the sharing and spreading of best practices within an organisation. Chrysler, the vehicle manufacturer made this work for them when the company decided to change over from functional departments to rather work around car platforms based on vehicle type such as small vehicle, minivan, SUV etc. To prevent loss of functional expertise, and to keep up with leading edge change, Chrysler's senior managers and engineers formed tech clubs, which were made up of experts from the various platforms. These clubs helped Chrysler to transition successfully to platforms, which lowered costs in Research and development and reduced vehicle production cycle times by more than half. These tech clubs are an integral part of DaimlerChrysler and meet frequently to discuss inquiries in all 11 areas of vehicle development. The tech clubs are responsible for analysing variations that occur in practice and set standards for the company. The engineers within the club are responsible for keeping an Engineering Book of Knowledge, which is a database on compliance standards, supplier specifications and best practices.

CoPs develop professional skills

Apprentices learn not only from master craftsmen, but more from advance apprentices and journeymen. Effective learning takes place when peers are available and willing to act as mentors to apprentices. This applies to both inexperienced workers as well as to experts. Even successful surgeons read peer re-viewed journals, attend conferences where their colleagues discuss new research and new techniques and travel to observe or work alongside their colleagues who are developing pioneering surgical techniques (Wenger, 2000).

CoPs help organisations to recruit and keep talent

According to Wenger (2000), American Management Systems, managed to retain consultants within the organisation, by inviting them to join their prestigious community of practice. Here these consultants were afforded the opportunity to work on challenging projects that utilised their skills set and also enabled them to develop new skills and locate new clients.

Characteristics of COPs

There are several characteristics that have led to the increased interest in communities of practice as a means for developing strategic capabilities within organisations. These characteristics are discussed below. These same characteristics of diversity, informality, autonomy, crossing boundaries, that make CoPs ideal for managing knowledge within an organisation, also pose challenges for traditional hierarchical businesses.

Diversity

CoPs are diverse. There are many reasons as to why people in organisations form CoPs. When an organisation creates teams across functional lines, people with the same expertise may create a CoP to keep in contact and share knowledge with their colleagues, who may now be in different teams and no longer in within close proximity to one another.

Size

CoPs can exist within a single business unit, or comprise many business units across an organisation, or even thrive with members from different organisations but from within the same sector. A CoP can have anything from tens of people to hundreds of people. Whilst the CoP can be large, all CoPs tend to have at its core, a group of dedicated and passionate people that drive the CoP, through their intellectual and social leadership (Wenger, 2000). Large organisations may be grouped as per geographical location or by subject matter to encourage active participation from the workforce.

Geography

Communities are not limited by formal structures, as connections are developed among people across organisational and geographical boundaries. Due to the use of Internet and World Wide Web technologies, CoPs have also become global. These virtual communities do not have to meet face-to-face and can exist independent of time and location.

Informal composition

Managers select team members for a project, based on their specific skills, and what they can bring to the project. Once the project is completed, the team is dissolved. With CoPs, membership may be a matter of personal choice, where a person decides to join, as he believes he can contribute to the community, and also learn through collaboration with his peers. Sometimes, new members recruited by existing members, who intuitively feel that the new member will be able to make some meaningful contribution to the CoP.

Evolution of COPs

Communities of practice have existed since ancient times. In ancient Greece, master craftsmen in the form of potters, masons, metalworkers, blacksmiths etc. shared social practices and also had business functions (Wenger, 2000). They worshipped the same deities, and master craftsmen trained young apprentices within their field of expertise and also spread innovation (Wenger, 2000). In the Middle Ages, the guilds served the same function for artisans in Europe (Wenger, 2000).

According to Li (2009) the earliest work of Lave and Wenger, Situated Learning: Legitimate Peripheral Participation, 1991, suggests that most learning by practitioners occurs within social relationships within the workplace, as opposed to the classroom. This is known as situated learning. Li indicates that the central theme of the Lave and Wenger's book of 1991 is the interactions that occur between novices and experts, and how novices form their professional identity. Lave and Wenger showed how midwives, tailors and butchers learnt their trade in the environment where those skills were being utilised. A lot of learning took place through the informal interactions as experts shared experiences and stories, and novices learnt by consulting with the experts. This process helped to identify gaps, and the development of solutions, led to the improvement of their practice, and new ways to address recurring problems.

In 1991, Lave and Wenger, defined CoPs as people from the same discipline improving their skills by working together with experts, and engaging in more complex tasks. The term 'legitimate peripheral learning' describes the process that novices follow to become experts by becoming involved in simple tasks and gradually graduating to more complex tasks as they

become proficient (Lave and Wenger, 1991). After mastery of the skills, the novices graduate to being experts, and will then become mentors themselves to other newcomers. Within this context, CoPs was seen as a system for people to obtain and master existing skills. Lave and Wenger stressed that CoPs cannot be intentionally created by organisations. However, apprenticeship programs can be formally developed with organisations for novices to be mentored by experts.

Li (2009) states that Wenger used situated learning to expand the concept of CoP in his 1998 book, Communities of Practice: Learning, Meaning and Identity. According to Li (2009) Wenger borrowed theoretical aspects from education, sociology and social theory to refine the CoP concept, with the emphasis on socialization and learning, and growth of the individual identity. Wenger examined a case study involving clerks processing medical claims, where the clerks interacted with one another and shared information in order to do their office work. This book did not expand on the expert-novice relationship, but instead discussed a CoP as an entity with 3 dimensions, namely: mutual engagement, joint enterprise and a shared repertoire. Mutual engagement refers to interaction amongst people that results in creation of shared meaning on issues or a problem. Joint enterprise refers to people being engaged in and working towards a common goal. Shared repertoire refers to the common resources and jargon members use to negotiate meaning and bring about learning in the group. These 3 dimensions outline the process of individuals' interactions within CoP groups. (Wenger,1998, p 125)

The 1998 work raised controversies about the use of the term community. Contu and Wilmott (2003) stated that members of a CoP usually come together to address a specific problem or concern, but in reality, not all communities are developed with a purpose. This could lead to the mistaken belief that any group structure is a community, which was not the intent of Wenger.

In the late 1990s, reports of CoPs began to appear in the literature. For instance, Orr's study, Talking about Machine (1996), documented an example about Xerox technicians, who were able through sharing of stories of problems they encountered with malfunctioning machines, to determine trends to solve problems that were not mentioned in any of the machine manuals or documentation available. Other examples are the Chrysler community of automobile engineers (Haas, 2003), the multi-disciplinary community from the World Bank (Wenger,

2002). CoPs have also been used broadly in the educator sector. Palincsar (1998) talks about the creation of an online CoP for science teachers in Michigan in order to share their knowledge and experience in teaching pre-schoolers through to primary school.

In 2002, Wenger, McDermott and Snyder wrote the book Cultivating Communities of Practice, wherein the focus shifted from individuals' learning and identity growth to a CoP becoming a tool those organisations could use to manage knowledge workers. Whilst previous publications stated that CoPs are informal groups that arose spontaneously, the latest book suggested that organisations could create and sponsor CoPs in order to gain market competitiveness (Li, 2009). Therefore, a CoP was now defined by Wenger et al., (2002), as 'groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis'. According to Li (2009), the definition of a CoP provided within the 2002 book was vaguer than the 14 indicators provided in the 1998 book by Wenger, and whilst the examples cited were from the business sector, the authors do not restrict CoP to groups within a company. According to Li (2009), this book cites CoPs as a means to foster innovation and creative problem solving within the organisation.

To make it possible for organisations to use CoPs as a management tool, Wenger changed the 3 characteristics of CoPs and named them as 'domain', 'community', and 'practice' (Wenger, 2002). The domain refers to the common ground that enables people to become members of the community and defines the boundaries that enable members to choose what to share, and how to present their ideas (Wenger, 2002). The community refers to the social makeup that enables learning to take place through interaction and relationships with others. The practice includes resources like documents, ideas, experiences, information, ways to address recurring problems, and is actually the knowledge that is shared, developed and upheld by the community. The authors claimed that CoPs optimise the creation and sharing of knowledge when these 3 elements of domain, community and practice work well together in a well-established CoP.

Wenger also introduced the roles of leaders/champions and facilitators. The leader or champion is a person who is well respected within the organisation, often in a leadership position, who is responsible for marketing the CoP, recruiting new members, and providing support to the CoP in the form of resources for group activities (Wenger, 2002). The facilitator is responsible for

the daily operations of the CoP, and is often holding a senior management position, and who understands the goals and objectives of the organisation, and is also a resourceful person, who is well acquainted with members and prospective members of the CoP (Wenger, 2002).

Since publication of Wenger's book in 2002, Saint-Onge and Wallace (2003) have thereafter provided another interpretation of CoPs, with the 3 components of 'people' indicating who is involved, 'practice' referring to what members do, and 'capabilities' which refers to the ability to influence competitive advantage in business. In addition, they proposed, three levels of CoPs, namely informal groups, structured groups and supported groups. An informal group provides a forum for interested members to discuss topics of common interest. Structured groups refer to CoPs that are sponsored by the organisation, and aims to develop skills for specific areas, whilst supported groups are setup and managed by an organisation and aims to promote the organisation's business strategy.

Types of COPs with examples

Supported and Managed COPs

To create CoPs from scratch, managers need to identify communities of practice that will improve the company's capabilities to achieve their goals through their chosen strategy. The organisation must also provide support in the form of infrastructure needed for the CoP to use their skills effectively. The managers must also develop non-traditional ways of measuring the usefulness of the community to the organisation.

CoPs should not be created in isolation. Quite frequently people who possess the passion and the ability to improve the organisation's essential capabilities already exist within the organisation. The challenge is to identify such individuals and bring them together as a community. At Shell, for example, an individual will receive help from a consultant to create a CoP. They will jointly interview prospective members, and also identify common problems or challenges from the various units within the organisation for the CoP to focus on. The interviews serve a two-fold purpose, as they result in both the gathering of information, as well as to engender enthusiasm for the as yet unborn community of practice. The group then meets for the first time when the co-ordinator organises a meeting whereby, they discuss and plan the

activities that will enhance both individual and group competencies and also expand the company's strategic agenda (Wenger, 2000). The formation of the CoP at Shell is an example where the process of forming the committee is managed to some extent by the consultant. However, the members of the committee decide the activities of the committee, and how to take the agenda forward.

Another important task is that the domain must be defined accurately, it must not be too wide, otherwise it runs the risk of members not participating as they do not feel a personal connection with the group's area of expertise and interests. Wenger (2000) shows how this happened at the United States Veterans Administration, which found that the community for claims processing lacked participation and made slow progress in its first year. The core group identified that the domain of the primary community was too wide, and that people could not identify with it. As a result, they then created sub-committees, of first line managers, customer service reps, and training co-ordinators, each with their own domains. Consequently, participation picked up, and progress was made with the first line managers sharing tips on how to implement the new team structure, customer service reps assisting with setting of standards to cut processing time, and training co-ordinators enhancing the organisation's training manuals.

Hill's Pet Nutrition Facility in Richmond

Let's look at how the community of practice at Hills Pet Nutrition facility in Richmond, Indiana operates as discussed by Wenger (2000).

The CoP at Hills Pet Nutrition facility in Richmond was formed after managers and technicians attended a retreat about CoPs and learnt of how the CoP could benefit them and their company. Thereafter, a CoP was formed, where members met on a weekly basis. Management supported the CoP by giving staff time off their work shift, in order to attend the meeting if their presence was needed. The CoP had a leader, known as the mayor, who was elected by the community. The leader's duty was to organise the weekly meetings and ensure that staff whose expertise was needed, would attend the meeting called. A proposal previously put forth by John to management to replace the balky conveyor belt technology in the plant with pneumatic tubes to carry the pet food to the packaging area. Management was not in

support of this idea, as they believed that the technology was untested, and therefore could not be relied upon. Also, they believed that the new technology was not compatible with the existing plant equipment. John's colleagues believed that his proposal had merit and encouraged him to pursue it, despite management resistance.

At a weekly meeting of the CoP, Roger, another technician with plumbing experience, attended despite him being off duty, and having to make an additional trip to the plant, when he was only due to report to work much later in the day. John presented evidence to the community from colleagues in other plants, that the pneumatic tube technology was reliable and compatible with the existing equipment. Roger, who was in attendance, confirmed this evidence, and he also volunteered to accompany John to the next meeting with management when he would present his proposal again. At the next presentation to management, his proposal was accepted. A year later the new technology was introduced in the plant. This resulted in reduced downtime and less wastage of pet food as it travelled to the packaging area. The community provided the members with the opportunity to solve problems that the plant was having. In addition, it could also result in financial rewards like bonuses due to improved plant performance.

Hewlard Packard CoP

A second example unpacked by Wenger is that of Hewlett-Packard, where a CoP was formed for product-delivery consultants in North America that meet via tele-conferencing once a month. Prior to the CoP being created with the help of KM facilitators, the consultants were mainly isolated from one another. The consultants dealt with sales and installation of specific software, called High Availability that aimed to reduce computer downtime for their customers. The members of the community found that they had many common problems and could assist and learn from one another. Through their interaction, they were able to standardise their software sales, and installation processes. Participation is not compulsory, but despite this, levels of participation are steady.

One of the tele-conferencing sessions focused on a consultant called Maureen, who was dealing with an installation for a major customer. Maureen shared her experiences with the community by being open and informal in her discussion of her experiences. Other members, who asked questions, and then provided examples from their own experience with their customers, often

interrupted her. This give and take helped to make the session worthwhile for the community. It assisted Maureen so that she was able to be more effective in her dealings with her clients. In addition, a bug in the software was causing many problems for customers. Rob, a member of the software development team was present for the tele-conferencing session in-order to create a stronger bond between the product delivery and software development teams. Rob already had a fix for the bug, but after listening to the consultants and hearing the problems being experienced, he was able to make the software fix even more effective. Rob also committed to providing feedback during the next month's community call.

The community members were learning from each other through by discussing their problems and hearing of how others had handled the same problem. This would help to make their work easier, and more effective. The sessions also help to build the community through the swapping of stories and the sharing of knowledge that takes place. These sessions help to re-enforce the functions and benefits of the CoP and for the CoP to be self-perpetuating (Wenger, 2000).

Virtual / On-Line COPs

If knowledge is embedded within a community, KMS can then be used to facilitate discussions, mutual engagement and exchange between members within the CoP. The KMS should include technologies for collaboration such as electronic discussion groups, electronic bulletin boards and chat facilities. Knowledge sharing takes place through tools that support posting and responses to queries, sharing stories of individual experience, and the discussion and contesting of issues appropriate to the community (McLure Wasko, 2000). Johnson states that "Virtual communities use networked technology, especially the Internet, to establish collaboration across geographical barriers and time zones" (Johnson, 2001). In traditional CoPs, members are clearly defined, and membership is usually based on a place within which the CoP is located, whereas in virtual community, membership is based on an idea or task. Due to the lack of face-to-face communication, the usual norms that control traditional CoPs do not apply (Johnson, 2001). Consequently, there is greater individual control within virtual communities. The world-wide-web (WWW) or Internet become the place that houses the virtual community rather than a place or organisation.

The development of online communities has resulted in Communities of Practice that are supported by information systems (IS). For online committees (OLC) to maximise their value in knowledge management terms, practitioners need an understanding of the means and practices that support members' decisions to share what they know (Sharratt and Usoro, 2003). Sharing involves a process whereby a resource is given to another party, without the original party losing the resource. Van Beveren (2002) states that an information system shares information, and that the sharing of information does not necessarily lead to new knowledge being created. Sharatt and Usoro (2003) indicate that knowledge sharing implies that new knowledge may be generated within the recipient. Face-to-face conversations can lead to requests for help, which can result in new knowledge being gained by the recipient. Pierce (2002) suggests that conversation may be the only effective means of sharing knowledge.

"Knowledge embedded in a community perspective views knowledge as owned and maintained by the community" (McLure Wasko, 2000). Knowledge exchange takes place through open discussion and collaboration, with an open knowledge forum that supports the dynamic exchange of ideas. Knowledge is seen to be public goods, and not individual goods, where members of the community collectively contribute to it, and all have access to the knowledge. There is little risk of someone with knowledge not being included within the exchange. With electronic communities, knowledge stays relevant, as knowledge is continuously being regenerated and recontextualised (McLure Wasko, 2000).

Why members were motivated to join a virtual COP?

According to the results of the survey conducted by McLure Wasko. & Faraj (2000), the following reasons were given for why they were members of an electronic community, namely: members felt a moral obligation to reciprocate, as they received assistance when they posed questions; members felt good about sharing knowledge and were challenged and learnt more as a result, and being able to assist people with problems; some of the members who were experts provided assistance to novice queries, some members felt a need to uphold the standard with the industry, and felt they were contributing to the knowledge within that field; some members felt that there was no need to re-invent the wheel, when there was existing solutions

out there, that was up-to-date, relevant, valuable and was received quickly, and difficult to find on one's own. Some expert members felt that being community members improved their professional status and helped to keep abreast of new developments within their field. The majority of people (41.9%) had a strong desire to be part of a community where they could exchange practice related knowledge with like-minded individuals((McLure Wasko and Faraj, 2000).

Factors affecting successful knowledge sharing in Virtual COPs (VCoP)

A study by Tremblay (2004) of 12 CoPs in Canada, showed that a number of factors were important, in contributing to the success of CoPs. Motivation of participants was the most important factor in the success of CoPs. A CoP made up of Healthcare professionals, were most satisfied despite giving of their own time, because they believed that the knowledge gained was worth their personal time invested, in participating in the CoP. Another important factor was the support and resources made available by the employer or the organisation responsible for the CoP. Participants also needed recognition of legitimacy of the CoP from their superiors. Another important factor was recognition given by employers, which could take the form of financial remuneration, or in another form like promotion, performance evaluation and skills assessment. Having a dynamic CoP leader, whose tenure is stable and not changing frequently, also provides good leadership, and contributes to the success of a CoP. All participants within the CoPs that participated in the study felt that the CoP had a positive impact on the work climate, despite having mixed feelings about the success and usefulness of the CoP.

Sharatt and Usoro (2003) indicates that management is challenged to spread new knowledge developed within an organisation in order to gain the most advantage from it. Chung (2001) states that a flexible, decentralised organisation structure encourages knowledge sharing whilst a centralised, bureaucratic management style can stifle creation of new knowledge.

An online system that is easy to use will encourage more people to use it. Also, if the online system is considered to be useful, more people will use it. In addition, the perceived usefulness of the system is influenced by the perception of the knowledge of the community's members (Sharatt and Usoro, 2003).

Trust in competence, honesty, intentions and concerns, and reliability is an important, element of an online community. McLure Wasko and Faraj (2000) suggests that organisations should adopt the view of knowledge for public good and should develop electronic communities of practice. Their findings indicate that successful communities have members that act out of community interest, instead of self-interest, and that their members have a strong desire to interact in intellectual exchange with a community of practice. This is why they join CoPs. They do not join communities of practice to make friends or socialise. Lastly, they indicate that people in these communities, like helping others, and feel a moral obligation to share information, rather than be selfish and only concerned with self-interest. Tremblay's study also revealed that participants appreciated collaboration between members, learning from others and the exchange and sharing of information, the solving of work problems, and the establishment of consensus, group-work and the development of new skills (2004).

Issues or Limitations of Virtual COPs

The IITMan case study described by Kimble et al., 2001, showed that participation within a COP was extremely important. The members indicated that face-to-face meetings were crucial to forming good relationships between participants, which enabled participants to go the extra mile when dealing virtually. Their face-to-face meetings took place at least once within every six months, enabled the COP participants to get to know one another. With virtual COPs, where members are never able to meet face-to-face, and develop a good relationship, this can have a negative impact on the participation of some members.

A problem of virtual communities is that it is easy for a community member to withdraw or absent himself from the community (Haythornthwaite, et al., 2000). This is most likely because there is no physical environment where members meet and interact with each other, and most often members don't know each other outside of the virtual community. According to LeBaron, Pulkkinen, and Scollen (2000) cultural differences amongst individuals can also hinder communication. Virtual community infrastructure can easily be set up across the World Wide Web and across cultures. However, these cultural differences can hinder the required smoothness of learning in communities of practice. Wenger (1998) indicates that different cultures can hinder the development of the CoPs' own culture which develops gradually. Also,

depending on the personality type, some people perform better in online or live environments (Palloff and Pratt, 1999).

A virtual community or any traditional organisation is the designed community, whereas the community of practice is what emerges from the designed community (Nachmias, et al., 2000; Wenger, 1998). The members of the community of practice will use the community products such as technology, processes, pictures, policies etc. in ways that may be different from their intended purpose (Johnson, 2001). Robey et al., (2000) indicates that virtual teams located in different parts of the USA, communicated important documents through email, which posed a security risk to the organisation.

Palloff and Pratt (1999) posed the question whether Web-based applications would be sufficient for the setup, maintenance and support of communities of practice. Johnson, (2001) answers in the affirmative provided that extensive support is given. Ricketts et al. (2000) discusses the case of a course where learning was promoted through an interactive style. However, several factors need to be taken into consideration where interactive learning is the modus operandi. The participants needed to be familiar with the technology used and lacked the necessary skills. Participants must be provided with adequate training so that they know how to use the technology through which the learning will take place. This will cost time and money to the organisation (Johnson, 2001). Participants needed skills in synchronous and asynchronous discussion, as well as on online collaboration. Fischer (1998), advocates having well defined performance outcomes for the designed virtual communities from which communities of practice will emerge.

Hammond (1998) states that whilst asynchronous discussions independent of time and place is advantageous, it has resulted in no urgency in responding, as there is no presence of other parties. Hammond (1998) also indicated that some collaborative learners were concerned about the permanence of posted messages, which indicates a concern regarding trust and safety in virtual communities. Ricketts et al. (2000) concludes that learners who are extroverts and prefer interaction rather than reflection, do not function well in virtual environments. Studies show that introverts are more comfortable and successful in online communities than extroverts (Palloff and Pratt, 1999). The “politeness syndrome” as described by Borthick and Jones (2000) indicates an environment that results in students being positive to another because they are not

familiar with one another, rather than being honest and constructive, which results in richer collaboration, which occurs when students know each other.

Technological Needs of Virtual COPs

Virtual communities are dependent on ICT for collaboration. The storage of documents, hold synchronous and asynchronous discussions, conduct web seminars and web conferences, online chats are areas where virtual communities need technological support. It is important to create virtual places where communities can meet, organise and exchange knowledge (Lessor and Everest, 2001). Discussion forums, bulletin boards, chatrooms are some of the tools that can be used to facilitate online collaboration. A combination of content in the form of text, graphics, animation, scaffolding and text-based communication can provide an appropriate environment for emerging communities of practice (Johnson, 2001). Interactive materials rather than text-based materials are essential in the virtual environment. According to Palloff and Pratt (1999), virtual communities are well suited for communities of practices to emerge due to the lack of traditional group norms caused by physical presence of community members.

Shared artefacts are important for crossing boundaries between communities (Hildred and Kimble, 2001). The use of shared artefacts amongst different parts of the virtual COP serves many purposes. It enables collaboration, sharing of soft knowledge, is the focus of meetings and discussions, planning and co-ordination. Shared artefacts may take the form of books, documents, stories etc. At IITMan, the artefact shared amongst the virtual COP was individual documents that were merged into one, after being shared, and discussed (Hildred and Kimble, 2005). Technology is necessary both for the joint creation and sharing of artefacts amongst members of the virtual COP.

Conversations can take place electronically though email and online discussion boards. With an online community, a member can post an open question or request for help on the discussion board of the community. This request or question is visible to all members of that online community. A member of the group that possesses the knowledge can then respond via the same discussion board. An advantage of the online community is that the conversation becomes available to the entire online community and can be archived and accessed by other members. Also, a single request can invoke several responses (Sharratt and Usoro, 2003). Online

conversations may occur in many forms. For example, knowledge may be shared in the form of a story describing a comparable experience that resulted in a method or technique being developed to solve the problem. If unable to solve the problem, a member may know someone else who might know, and be keen to assist. Knowledge sharing allows the source of the knowledge to use the online community as an instrument to effectively communicate what they know. This process can then bring about the required comprehension in the recipient, resulting in the development of a solution to the problem (Sharratt and Usoro, 2003).

Material Resources to facilitate COPs

CoPs do not have a budget like established departments within an organisation, and therefore are at greater risk of not succeeding, unless the community is integrated within the business and receives support from management. Management must be prepared to provide time and money if CoPs are to reach their full potential. Face to face meetings assist greatly in building relationships and trust amongst CoP participants within an organisation. When participants of an organisation's CoP, are scattered geographically, management should budget for activities that allow face-to-face meetings (Ricketts et al., 2000). The support must be provided when communities encounter problems like IT systems that don't assist them, promotion systems that don't recognise contributions from the community, and reward structures that does not encourage collaboration. This includes communities establishing relationships with related initiatives at corporate universities. Communities can be given support through sponsors and support teams. The sponsors and support teams cannot prescribe to the community their activities or outcomes. The task of support teams is to work alongside community leaders and to provide resources and co-ordination. This can be illustrated through the case of 2 organisations, namely American Management Systems (AMS), and the World Bank.

American Management Systems (AMS)

Membership in a community of practice at AMS is a privilege. Potential members have to be recognised as experts by their line manager to be able to join the community. Community members have to contribute to at least one knowledge development project per year to maintain their membership. Community members get to attend the annual conference where all members from the different communities within the organisation get together. Community members

attendance at workshops, the annual conference and participation in community projects are paid for by their business unit.

World Bank

In order to better fulfil its mission to eradicate poverty, The World Bank established a goal to become a "knowledge bank", that is to provide high-quality information on economic development. Main people within the organisation then created communities of practice. Membership was open to all staff members, who could also decide on their level of participation, according to their needs. The various communities within the World Bank receive funding for their activities and are responsible for managing their own budgets.

Both AMS and the World Bank, communities of practice receive support from their senior board, in the form of sponsorships and support teams. The support team help with the organising of activities like conferences, fairs, library services and technical support. Both organisations also have a Knowledge manager, who helps the community leaders. These facilitators engage in activities such as organise events, handle member queries, and to the keep the community informed on information from external sources.

Both these companies have enjoyed success in implementation of communities of practice, although having employed different means of membership, and rewards for participating members. AMS has a promotion system that recognises members' contributions. In addition, members are rewarded through early access to innovative technology and special business cards that speaks to their expertise. The World Bank also uses its personnel evaluation system to recognise members' contributions and relies on the intrinsic benefits gained by community participants such as the opportunity to solve problems, develop new ideas, and build relationships with peers who share the same passion. The communities have spread knowledge through its operations and contributed significantly to achieving the goals of the organisation.

Conclusion

Measuring Value or success of Communities of Practice

The value derived from a community is often difficult to understand. The results of community activities may be delayed and may appear in the work of teams and units. It is also hard to ascertain whether an idea that arose out of a community meeting, would not also have arisen in a different setting. As a result, the value of communities is often difficult for managers to determine (Wenger, 2000). The ideal manner in which to assess the community's value is through the anecdotal stories told by community members. Stories must be collected in a systematic manner so as to be true representation of the diversity and range of community activities. At Shell, stories collected are published in newsletters and reports. AMS has an annual competition, to find the best stories. These stories are then analysed to determine the savings made by the company, as well as its' impact on revenue (Wenger, 2000). An analysis of some of these stories showed that 2 to 5 million dollars were saved by the company due to the influence of communities of practice, and income had increased by an additional 13 million dollars within one year (Wenger, 2000).

CoPs can have an impact on organisations by helping to drive strategy like in the case of the World Bank or be responsible for initiating new lines of business through brainstorming of new ideas. CoPs can also solve problems quickly as members use their expertise to assist other members to solve problems. CoPs are also used to transfer best practices as members share best practices within the organisation and to also develop professional skills within the organisation as experts mentor apprentices. CoPs can also help organisations to recruit and keep talent as joining a prestigious CoP and working on challenging projects enables employees to develop new skills.

Chapter 4:

Web 2.0 Technologies

Introduction

The appearance of a new set of technologies in the new millennium, that was innovative and deemed to be so important that they warranted a new version number for the Web. Web 2.0, the new title, was put forth by technology writer and publisher Tim O' Reilly, in September 2005, on his company's web site as "What is Web 2.0?" O' Reilly and web pioneer, Dale Dougherty, observed that the Internet had not crashed following the dotcom collapse, but had become very important, with new exciting applications and web sites. They felt that the dotcom collapse marked a turning point for the web, and that the title Web 2.0 was justifiable. The term Web 2.0 was created to describe these new technologies, and their impact on the Internet. Andrew McAfee wrote a book titled "Enterprise 2.0 New Collaborative Tools for your Organization's Toughest Challenges" that was published in 2009, that is devoted to this topic. McAfee coined the term "Enterprise 2.0" in 2006 in a Sloan Management Review article to describe how Web 2.0 technologies could be used in organisations intranets and extranets, and its impact on business

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McAfee is a regular speaker to academic and business audiences and has also taught executive education programs to business executives worldwide.

This chapter examines the concept of Enterprise 2.0, its features, how it was used in 4 different organisations, and the benefits that these organisations gained, as described by Andrew McAfee in the book. McAfee was initially sceptical of the impact of these new Web 2.0 technologies, due to the meltdown of the dot.com industry and the previous over-exaggeration of the Y2K problem, which did not happen as anticipated. He thought that the novelty and impact of Web 2.0 was exaggerated and would not be significant. McAfee began his investigation in order to prove his jaundiced belief, that Web 2.0 was just a novelty, and was not here to stay. McAfee was surprised to find that the new Web 2.0 Technologies developed to support communities on the web, was being used within companies and having a significant impact on those companies. He believes that the benefits of Enterprise 2.0 are available to any organisation (McAfee, 2009).

Overview and Key Features of Web 2.0 Technologies

O' Reilly and his colleagues examined companies, organisations and web sites that represented Web 2.0. Their list included Wikipedia, social networking sites Facebook and MySpace, Web-bookmarking resource Delicious, media-sharing sites YouTube and Flickr, blogging utilities like Blogger, Typepad and Technorati, the blog-tracking site, web search engine Google and location based classified ad site Craigslist. Many of these sites were fairly new; lending credence to the belief that there was in fact a new version of the web. More support was garnered by the enormous popularity of these web sites, as based on the Alexa ranking service, by August 2008, six of the 10 most popular websites in the world were now Google, YouTube, Facebook, MySpace, Wikipedia and Blogger. These new sites were part of the new Web, or Web 2.0 as O' Reilly liked calling it. In December 2006, O' Reilly, posted a short definition on his blog: "*Web 2.0 is the business revolution in the computer industry caused by the move to the Internet as platform, and an attempt to understand the rules for success on that new platform. Chief among these rules is this: Build applications that harness network effects to get better the more people use them.*" Some of the questions posed were the importance of these collaborative technologies to companies outside the IT industry, and to executives, management and front-line employees not involved in software development.

O'Reilly's definition highlights network effects, which is that some resources become more valuable to each member, as they attract more and more members. McAfee discusses the convergence of the three trends that has led to Web 2.0. McAfee describes the three trends namely:

Free and Easy Platforms for Communications and interaction

Emailing, SMS, and instant messaging referred to as channels by McAfee allow for private communication, as others are unaware of the messages that have been sent between the sender and receiver, or that communication has even taken place. Information sent in this manner, is not widely visible, available and cannot be searched for. The alternative to channels platforms refers to collections of digital content that are visible, readily available and whose access can be restricted if needed. However, the chief objective of platforms is for information to be widely and always available to its members.

Every web site is a platform. Initially only companies and individuals with some technical expertise built websites as time and money were also needed to create, upload and maintain websites. This was until the advent of weblogs or blogs as they are better known as appeared in 1997. Blogs, which are free and easy platforms, allow people to add content to their websites on a frequent basis, at no additional cost, other than bandwidth, and without having to possess technical skills. Other platforms like Facebook, MySpace and Blogger allow users to combine different types of media like text, video, music, pictures without any more skills than point, click, drag, drop and type.

A Lack of Imposed Structure

As the entrepreneurs and designers were creating the new, free and easy platforms, they sought to not impose their own ideas on how content and work should be structured and made deliberate attempts to avoid such imposed structure. Imposed structure in this context refers to workflows, decision rights, interdependencies and information. A workflow refers to the business process that shows the tasks, and the sequence in which these tasks have to be carried out, as well as the points at which decisions are made. Decision rights refer to the authority given to people to make decisions. Interdependencies refers to people that will work together,

and the relationships between these people within the workflow could be differentiated through the decision rights that they possess.

Traditionally the belief that good outcomes come from tightly structured processes was an unquestioned assumption held by managers. KM systems impose structure on information, by determining which people and groups had rights to add to it. This faith in structure originates from the theories of Frederick Taylor from the early twentieth century. McAfee questions whether good outcomes can be achieved, without imposing tight structures. The early case study of Wikipedia provides fascinating insight into these issues. Wikipedia is well known as an online encyclopaedia that can be edited by anyone. The Wikipedia community and the technology that supports it makes no attempt to impose any of the elements of work structure discussed previously. Workflows and interdependencies are not specified in advance, neither is the information that will be included within any article. Nor is there much in the way of important decision rights. The administrators, bureaucrats and stewards of Wikipedia have no more say than any new Wiki contributor in creating or modifying articles. Wikipedia's open, unrestricted approach and lack of structure is so deeply embedded and widely accepted, that's it hard to believe that the company originally operated under a very different set of ground rules that imposed strict control and structure (McAfee, 2009).

Founders Wales and Sanger had always wanted to create a high-quality online encyclopaedia that would be available freely worldwide through the Internet. They adopted the standard approach and tightly structured the content creation process to develop a web-based encyclopaedia named Nupedia. They had an extensive peer review process aimed to produce articles of a high quality on par with that of professional encyclopaedias. After eighteen months of operation, and $250,000 expended in operating cost, only 12 articles had been published in Nupedia. Due to the slow growth of Nupedia, Wales and Sanger started investigating other models to produce content, and learnt about Wikis, which is Ward Cunningam's technology developed to improve collaboration amongst software developers.

In 1995 Ward Cunningham developed web pages, which could be edited by its readers, to share his innovations and knowledge about software development with his colleagues. He named his creation WikiWikiWeb, which was later abbreviated to wiki. A wiki allows users to add, edit or delete any part of a wiki. Wikis are supported by a database that keeps track of all changes,

allowing users to compare changes and return to any previous version. Wiki's allow all contributions to be kept always, and the actions of all users are evident and revocable. Sanger and Wales decided to use wikis to solve the problems with Nupedia. They met with resistance from their advisory board, and hence set up a separate web site, www.wikipedia.com, which they did on 15 January 2001. By December of the same year Wikipedia had approximately 19000 articles. In 2003 Nupedia had only 24 finished articles and was officially closed down. At the time of McAfee writing his book in 2008, Wikipedia was the most widely referenced work in the world, with over 2.4 million articles in English and more than 500,000 articles each in German, Polish and French, another 250,000 articles in each of six other languages. The shift in philosophy from a highly structured model to a democratic, free and uncensored approach using wiki technology saw an unprecedented explosion in the growth of Wikipedia (McAfee, 2009).

Mechanisms to Let Structure Emerge

The web-based bookmarking site Delicious that was bought by Yahoo in 2005 is another example of the wide shift in thinking away from imposed structure, in this case referring to the structure of millions of websites that make up the World Wide Web. Originally, Yahoo employed taxonomists to categorise the websites using predefined categories. However, with the explosive growth of the web, the experts were not able to keep up. The taxonomy was removed from Yahoo's home page in August 2006. Delicious is a website that allows its users to store their bookmarks online to be accessed from anywhere in the world. Delicious also allows members to use a tag that is a simple one word to describe their bookmark. These tags would be used to group websites together for users, resulting in a categorisation scheme that would be useful for them.

The amazing success of Google is because it does a better job of returning relevant results in comparison to the other search engines by employing a very different approach to search. The founders of Google were inspired by the standard method for judging academic papers and developed an algorithm that ranked pages according to the number of pages that linked to them and gave more weight to sites that were themselves frequently linked to. This algorithm became known as PageRank and is at the core of the Google search engine. Google was the first search engine to view the web as a community rather than a collection of individual websites, and to

realise that this community referenced one another extensively through the use of hyperlinks. Google has enjoyed unprecedented popularity and success to the extent that the phrase "too Google" has been included in the Oxford English Dictionary since June 2006.

Although the web appeared to be unstructured, it is actually structured due to the links used to navigate from one web page or web site to another. Complexity Science uses the term *emergent* to describe systems such as ant colonies, where low level activities of the ants generate high-level structure, and the web (McAfee, 2009). *Emergence* is the appearance of global structure as a result of local interactions. The web is emergent due to it being the dynamic creation of innumerable people throughout the world interacting with one another through links as they create new content (McAfee, 2009). Unlike the web, most corporate intranets are built and maintained by a small group of people and are not as extensively linked as pages on the Internet (McAfee, 2009). Emergence needs a big number of participants and interactions.

The use of tags, as implemented by Delicious and other sites, allows structure to emerge over a period of time. Although users have complete freedom and choose their own tags, the same small group of tags gets frequently used to describe bookmarks that they have tagged. Over a period of time, this is used by Delicious to create tag clouds that shows the most popular tags being used. The tag cloud is arranged alphabetically, and the size of font indicates its relative popularity, with shaded tags belonging to the user viewing the tag cloud. Selecting a specific tag within the cloud displays a list of all websites that have been given the same tag, as well as how many people have tagged the page, and the collection of tags and pages associated with each user, provided that the user has allowed for this data to be made public. A tag cloud is referred to as a folksonomy by the information architect Thomas Vander Wal. He describes a folksonomy as an alternative to a taxonomy, which is created at a single point in time by an authority. Taxonomies are not inferior and are still relevant in this new era, as the classification of the living things shows. But the success of Delicious indicates that folksonomies offer benefits for classifying content that has many dimensions and changing at a rapid pace. Tagging, which was first used by Delicious in 2003, was used by Flickr, the photo sharing website in 2004, and has spread to other popular Web 2.0 sites like YouTube and Facebook. Tagging and linking meets the standard criteria for emergence as listed by McAfee below:

- Its conducted by many agents spread all over a digital platform like the Internet.

- These agents act independently and with autonomy.
- Agents act in their own self-interest.

Emergent Social Software Platforms

All these sites are examples of what McAfee terms as emergent social software platforms (ESSPs). McAfee (2009) breaks down the definition as follows: Social software allows people to connect or collaborate using computer / digital means of interaction and to form online communities. Platforms refer to digital environments where contributions and interaction are visible and available over a long period of time. Emergent means that the software is freeform and contains mechanisms such as links and tags to make the patterns and structure inherent in people's interactions visible over time. Freeform means that the software is most likely to be optional, free from imposed structure, indifferent to credentials, titles or other forms of rank and accepting of many types of data. ESSPs share some technical features, for which McAfee coined the acronym SLATES (search, links, authoring, tagging extensions, signals).

Technical Features of ESSPs

Search: for any information platform to be of value, it must be simple for users to locate what they are looking for. People prefer to use keyword searches rather than web page layouts and navigation aids. McAfee indicates that many of his listeners find it easier to find information on the vast, uncoordinated Internet, rather than their corporate intranet.

Links: it is due to links, and the development of Google's PageRanking algorithm that searching the Internet was made simple. This algorithm works best when there is a dense linking structure that changes over time and shows the opinions of many people. This is true of the Internet, but not the intranet that is usually maintained by a small group of people. This can change, if the intranet comes to be authored by a large group of people, rather than a small group.

Authoring: Blogs and Wikipedia have enabled people who have a desire to write for a broad audience, to be able to that. Ward Cunningham's wiki technology gives people the opportunity to feel comfortable to write, so that the structure of what they have to say, can be discovered.

Contributions may take the form of experience, knowledge, insight, a fact, an edit, or link and so forth. Authorship is a way to obtain these contributions. The use of authoring tools within the organisation will transform the intranet so that it becomes the continually updated, entwined work of many people rather than just a few.

Tags: A Forrester Research survey showed that what people wanted most from corporate intranets was firstly better searching mechanisms and secondly, better categorisation of content. Sites like Flickr and Delicious allow their users to create tags that suit the needs of the user, and these tags over a period of time form a categorisation scheme known as a folksonomy.

Extensions: Algorithms are used for categorisation and to detect pattern matching. Algorithms are used to tell users by extension that if they liked that, then they will also like this. Amazon's system of recommendations to customers was one of the first e-commerce sites to use extensions on the web.

Signals: Websites are updated frequently, and it can become quite overwhelming for users to keep abreast of all the changes in all the websites that they are interested in. A new technology, really simple syndication (RSS) signals users when new content of interest appears. Authors like bloggers create a short notice usually a headline in the form of a link to the full content. Software for users called aggregators or readers will examine sites of interest for new notices, will download these notices, sort them and then display them to the user. Consequently, users don't have to surf for new content constantly, but will instead check their aggregators, and then click on the link for headlines of interest, to be taken to the new content.

In view of the background given, McAfee provides a more precise definition for Enterprise 2.0. "Enterprise 2.0 is the use of emergent social software platforms by organisations in pursuit of their goals.", (McAfee, 2009). This definition focuses on organisations such as companies and public sector agencies, and how they use the ESSPs to do their work better. These ESSPs include all participants such as employees, suppliers, customers, and potential customers etc. Enterprise 2.0 includes not only intranets, but also extranets and public sites as well. McAfee points out repeatedly that Enterprise 2.0 is not just a technological phenomenon, organisations have to do more than just use ESSPs, they have to create environments that allow people to use

ESSPs widely, deeply and productively. Management cannot assume that healthy communities will self-organise, and act in a coherent and productive way, after Web 2.0 tools are used.

Norms, Policies and Guidelines

Wikipedia is an example that illustrates much effort was made in defining the ground rules of the community so that its members could interact with one another in mainly positive ways. These ground rules took the form of informal norms, and formal policies and guidelines. Wikipedia strived to create a cooperative and helpful culture. Senior members took most decisions through mutual agreement. Contributors that were excessively harsh or quarrelsome were corrected by their peers and barred if they were found to continually ignore advice and contravene norms. In order to complement and reinforce their norms, Wikipedia also developed a set of policies and guidelines for editing that became known as the "five pillars of Wikipedia". These policies and guidelines were developed over time, as it became evident that more structure was required. The structure of Wikipedia is not fixed and continues to be emergent.

In 2005, the scientific journal Nature carried out a study and compared the same set of science articles in Wikipedia to the online version of Encyclopaedia Britannica for accuracy. Encyclopaedia Britannica was found to have 123 errors, and Wikipedia had 162 errors, with averages of 2.9 and 3.9 errors per article respectively. The study's list of errors was made available on 22 December 2005, and by January 2006; all of these errors were rectified. So, Wikipedia is clearly working. If one wants a truly accurate article, them clearly one can't rely on Encyclopaedia Britannica either.

Background of Case Studies

McAfee uses 4 case studies that vary with regards to size, private or government, and use of technology. Three are companies, whilst the fourth is a government organisation. Two of them are large organisations, whilst the other two are small. Two of the organisations come from a high technology zone, whilst the other two are not. These organisations present a wide range of problems such as the capture and sharing of knowledge, training of staff in a fast-expanding company, allowing staff to collaborate across a big, disjointed organisation, and giving people improved, simpler and quicker access to information that they require so that they can perform better in their jobs. All the case studies focus on group level work, and interaction among

knowledge workers. At the time, new technology was used in all 4 cases to resolve the problems being encountered. Older technology created for collaboration, was not appropriate for the difficulties experienced within those organisations (McAfee, 2009). McAfee discusses the origins of these technologies, and why they are well suited for the business needs, as experienced by the organisations in his case studies.

The case studies are placed in specific order based on the level of interaction amongst the employees. The first company is small with a small group of employees that work in close co-operation. The second case study concerns a company with more employees in many locations, who don't know each other well. The third case study deals with knowledge workers within several organisations, who should be communicating and sharing information and expertise with each other but are not doing so. The last case study deals with all the employees of a large company, most of who will never need to work together. "In each successive example, the strength of the professional relationships between the people involved decreases, moving from close associates to professional strangers" (McAfee, 2009). This progression shows the remarkable flexibility and usefulness of Enterprise 2.0 tools. McAfee explains that this sequence also highlights a useful framework whereby the concept of tie strength, which is the depth and closeness of professional relationships between colleagues, benefits from the new tools of collaboration regardless as to whether colleagues are close, or professional strangers, or their association is something in between.

Case Study 1: VistaPrint

VistaPrint was a printing company that was founded in 1995 within the direct marketing industry for printed products. The company differentiated itself from its competition by offering 250 business cards for free to clients, who only needed to pay the shipping cost. The free cards helped to market the company, and by 2008, over 3 billion cards had been given away by the company. VistaPrint became proficient at up-selling, i.e., influencing customers to opt for a better product, by paying a small amount. VistaPrint learned that customers were willing to pay more for what they perceived to be a superior product.

VistaPrint had their engineers modify the printing presses and also develop software that would examine job orders and combine jobs for printing together to minimise wastage. This enabled

VistaPrint to print large volumes of small online jobs as cheaply as possible. Satisfied customers became repeat business and purchased additional products. VistaPrint expanded their business to include a wider range of products and also began marketing their products and services to small businesses. VistaPrint grew swiftly, without making any acquisitions and by 2008 the company had revenues of $400 million and employed 1400 people in 6 locations in North America, Caribbean and Europe.

Due to the rapid growth experienced, VistaPrint had to hire many engineers and technology support staff and managers were concerned with how to integrate the large number of new recruits without burdening the existing workforce, or jeopardising anything the company had built. It would be easy for a new recruit to cause damage to existing programs, by not following proper procedures. There was no comprehensive and easy way to consult reference work for new employees. Such a reference work would be time consuming to develop, and would become obsolete, as the company's technology was changing rapidly. The company had a shared hard drive on which documentation and other reference work were stored. However, the majority of people felt that it was disorganised, and difficult to search. Another concern was that when experienced employees left the company, they left little behind that could be accessed or searched for by others. Also, even as the company and its environment continued to change, the body of knowledge needed to remain current.

For VistaPrint, a relatively small company in the printing industry, managing growth and training new employees had become major challenges. The company needed to capture its own engineering knowledge and share it with new recruits, so that they could become productive as quickly as possible.

Case Study 2: Serena Software

In 2007, Serena Software had been an enterprise software company that helped its clients to manage their enterprise software. Large companies have software from many vendors that needs to be configured and modified to meet the company's requirements, resulting in complex software environments. Serena produced application lifecycle management software that enabled companies to keep track of bug fixes, upgrades and the release of new versions. Serena supplied this software to over 95 of the Fortune 100 companies.

Serena had been established during the mainframe era, and still offered mainframe products in 2007. The CEO of Serena, Jeremy Burton and other executives wanted Serena to enter the growing market that assisted companies to build "mashups". Mashups use conventional Web 2.0 technology and have become popular since companies like Google have allowed access to their applications, so that virtually anyone could use and add to their applications without having to get permission. Chicago Crime is a very popular Web mashup, which uses Google Maps and allows people to see crime patterns for their area. Mashups were a profound change from Serena's existing products. Corporate mashups were about relinquishing central control of enterprise IT, whereas Serena's products emphasise keeping control. Burton was unsure if Serena's employees with an average age of 45, with technical skills acquired in the era before the Internet, were familiar enough with Web 2.0 technology to develop the software needed for corporate mashups.

Burton also felt that employees did not know one another well enough, and as a result lacked a sense of community. Unlike Vista, Serena had not grown organically and had acquired other companies, many of them being from other countries. In 2007, Serena had over 800 employees in 18 countries, with 35% of these employees working from home and having little if any face-to-face interaction with colleagues. People often worked in virtual teams, and even after years of working with each other, did not know much about their colleagues. Burton wanted to increase Serena's sense of community, but was unsure of how to do this, with the workforce being globally distributed.

Case Study 3: The United States (U.S.) Intelligence Community

Following the September 11, 2001 terrorist attacks on the United States, several groups investigated the performance of the country's intelligence community, made up of 16 agencies, and were not happy with their observations. Their findings could be summarised with two phrases that became popular during the investigations, which are: even though the system was blinking red before 9/11, no one could connect the dots. In an interview with the 9/11 Commission, Central Intelligence Agency (CIA) director, George Tenet, upheld that "the system was blinking red" in the months before the attacks. There were sufficient warnings conveyed to the highest level of government in the summer of 2001 that Al Qaeda led by Osama bin Laden were planning large-scale attacks, possibly within the United States.

These warnings were accurate and urgent because various members within these agencies were convinced of the serious risks posed by Al Qaeda and determined in their hunt of this organisation. Groups within the CIA, FBI and U.S. Security council were all working separately to counter terrorism in the U.S.

In the months leading up to 9/11, worrying signs were apparent to intelligence agents. Agent Ken Williams from the Phoenix office of the FBI wrote a memo addressed to the bureau's counter terrorism division, emphasising bin Laden's attempt to send students to civil aviation universities and colleges in the US. Williams put forth a suggestion to monitor flight schools nationally. On July 5th, the U.S. Security Council chief held a meeting with representatives from many agencies and informed them that something momentous was going to take place soon. Zacarias Moussaoui, who would later be found guilty as a conspirator in the 9/11 attacks, was taken into custody by FBI agents from the Minneapolis office, and recognised as a terrorist threat. A search warrant requested to search Moussaoui's laptop and personal effects was only granted after the 9/11 attacks occurred.

Despite all these pieces of evidence, no one was able to connect the dots, and see the nature and timing of the coming attacks clearly enough to prevent them. Investigations showed a main reason for this disaster was the lack of effectual information sharing both inside and thru intelligence agencies. Reports transmitted up or down narrow channels following the chain of command within an agency went no further if someone, within that chain decided that the issue did not need further investigation or action. There were few accepted or relaxed ways to share this information more broadly within the community. This led the 9/11 Commission to conclude that the attacks could have been prevented and made recommendations to improve the intelligence community for better sharing of information. This included the creation of a Director of National Intelligence with oversight over the 16 agencies. Many doubted the ability of the intelligence community to change and to share information due to its culture of sharing based on a need-to-know basis (McAfee, 2009).

Case Study 4: Google

In 2004, Bo Cowgill, a new employee at Google straight out of college, read James Surowiecki's book *The Wisdom of Crowds*, and was inspired by the theme of "collective

intelligence", that it was often possible to employ the collective intelligence of a group of people, and that this would give better knowledge, than any individual within the group could possess.

The Wisdom of Crowds provides many examples of collective intelligence. The Iowa Electronic Markets (IEM) was an ongoing study started in 1988 at the University of Iowa, investigated whether the principles and tools used by stock markets could be used to predict the results in political elections. The IEM and similar environments are known as prediction markets. Just like stock markets, prediction markets use securities that have a price. In prediction markets, securities are related to future events like the U.S. presidential election. Each security represents a different candidate, and its price is meant to reflect the predicted percentage of votes that that candidate will win in the forthcoming election. The IEM's margin of error of 1.49% in predicting the winners of 12 national political elections held in 5 countries compares favourably to the 1.93% margin of error of voter polls taken before elections. Another example is the Hollywood Stock Exchange, a web-based prediction market, proven to be highly effective in predicting the revenue that Hollywood movies will generate in their opening weekend. Prediction markets seem to show that many people can know many things. Surowiecki was amazed at corporate America's lack of interest in potentially excellent information from prediction markets, as a means to improve their decision-making, by exploiting the collective wisdom of their employees (2005).

Cowgill believed that prediction markets were a natural technology for Google. He wanted to start a prediction market at Google, and needed colleagues, especially those with programming skills, to assist him with this quest. Ilya Kirnos was a colleague at Google with programming expertise, with an interest in giving people a forum to make predictions. He created an application called "itoldyouso" that allowed people to make nonmonetary bets, and to keep track of their bets over time. This application gave them the satisfaction of stating "I told you so" when they won their bets. Cowgill and Kirnos, did not know each other, and worked in different functions within Google. Prediction markets was also not part of their job descriptions. Would they be able to find one another, combine their talents, and create a technology to exploit collective intelligence?

None of the case studies mentioned above which involved collaborative work, used software such as groupware and KM systems, which were meant to support collaboration between teams and groups other than for email functionality (McAfee, 2009).

The Strength of Weak Ties

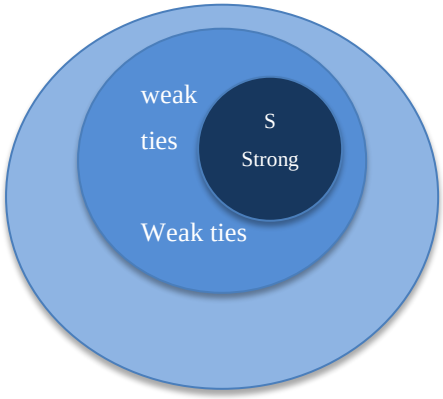
Although emergent social software platforms (ESSPs) take many forms through the different tools, and can be used in a variety of ways, and every deployment will be unique, there are deep similarities (McAfee, 2009). McAfee uses the concept of tie strength between people to show these similarities. The use of ESSPs may support ties that are very strong or be aimed at ties that are weak or non-existent. The case studies examined in this chapter provide 4 different levels of tie strength, which McAfee presents as rings in an "Enterprise 2.0 Bull's-Eye". Being aware of this bull's-eye, can help leaders choose where they want to focus their Enterprise 2.0 energies.

In 1973, Mark Granovetter put forth a novel theory in an article "The Strength of Weak Ties" that was published in the American Journal of Sociology. This paper became known as SWT. Granovetter summarized this theory in a follow up article written 10 years later. Granovetter asserts that our acquaintances (weak ties) are less likely to be socially involved with each other than our close friends (strong ties). Each acquaintance will have their own close friends, making up dense social structures. Granovetter concludes that strong ties are not likely to act as bridges between networks, but that acquaintances (weak ties) are good bridges between different densely knit groups. Granovetter's paper did not examine work environments, but it drew attention on a previously ignored area. Granovetter's article led to further research by others to determine whether his hypothesis and conclusions could relate to companies. Morton Hansen (1999), discovered that weak ties assisted product development groups to carry out projects faster. Hansen also illustrated that the cost of searching for information could also be lowered through the use of weak ties. Granovetter (1983) writing "… social systems lacking in weak ties will be fragmented and incoherent. New ideas will spread slowly, scientific endeavours will be handicapped …" could quite easily apply to companies.

In his article "Structural Holes and Good Ideas", Ronald Burt (2004) states "behaviour, opinion, and information, broadly conceived, are more homogeneous within than between groups. People focus on activities inside their own group, which creates holes in the information flow be-tween groups, or more simply, structural holes." Ties can span holes, and weak ties can be very effective in this regard, but there is no certainty that all structural holes will be filled (Granovetter, 1973).

Rapid growth through acquisition, globally distributed offices, and a large percentage of its workforce working from home, made it hard for the employees at Serena Software to form even weak social ties with one another. Granovetter's conclusions implies that the lack of such ties, would hinder Serena's ability to establish a healthy company culture, and also obstruct employees from doing essential and unique work. Another fragmented and handicapped system that developed due to unspanned holes was the intelligence community, which failed to prevent the 9/11 attacks or make clear whether Iraq possessed any weapons of mass destruction.

The Enterprise 2.0 Bulls-Eye



The Bulls-Eye diagram, shown above, is used by McAfee to represent the three types of ties, namely strongly tied colleagues, weakly tied colleagues and potential ties, from the view of a knowledge worker inside a large geographically distributed organisation. The strongly tied colleagues are a small group of close collaborators, to whom she has strong professional ties. Beyond this group, is another group of weak ties, which refers to people she worked with

previously on projects, co-workers that she engages with from time to time, as well as colleagues that she knows only through introductions. Beyond this set of weak ties, is a larger set of potential ties, colleagues or acquaintances that could be of value to her if she knew of them. These people could assist with answering pressing questions, help her to identify crucial resources, share progress to common problems they are both working on, in short prevent her from having to re-invent the wheel. Also, our knowledge worker, provided she is willing, could assist other people in the company by sharing her work experiences, if her abilities and existence were known. But, if no bridge exists between the knowledge worker and the large group of potential ties, these potential ties will not become actual ties. This is a loss to the organisational leader, who would prefer all networks to be connected, provided it does not cost too much to the organisation.

New Tools for Strongly Tied Colleagues: Vista Print and use of Wikis

Wikis are ideal for creating and modifying documents at the centre of the bull's-eye, where there are strong ties between collaborators. Wikis solve the problem of version control for sharing of files and simultaneous editing and are efficient tools for use by strongly tied colleagues. Whilst the first wikis were created to edit text, wiki-like tools to edit spreadsheets and presentations have also been developed. Wikis keep all contributions from collaborators in a central repository, so that different versions are no longer stored on individuals' computers. MediaWiki, the software used to create Wikipedia, alerts users when they are trying to save the page they are working on, by showing them the edits made by others, since the file was last saved. Google Docs, which is a wiki like word processor from Google, comes the closest to showing the edits of others as they are occurring.

At VistaPrint, wiki technology was used to capture and spread the knowledge of the company's engineers. A list of 1000 topics, with its many types of relationships, and more general associations was drawn up. Wikis was chosen because of its ability to be edited, or modified, and reversed to a previous state if need be, as previous versions of the wiki are saved, before any changes are made. There are few rules, and people are free, to critique other contributions. Wikis are easy to use, and also allows for users to add structure through the use of links and tags to show how topics are related. VistaPrint employees were willing to capture their knowledge on the wiki. Links and tags were added to format content captured to make the wiki

was easy to read, navigate and search. As the wiki grew, it became more useful to the company's engineers, who then became more likely to contribute to the wiki. All of VistaPrint engineers had either contributed content, and / or used the wiki.

New Tools for Weakly Tied Colleagues: Serena Software and its use of Facebook

In the middle ring of the bull's-eye signifying weak ties, an ESSP that can strengthen weak ties should be considered. At Serena Software, the social networking software (SNS) of Facebook proved to be highly effective in connecting weakly tied collaborators and allowing them to interact with one another.

At Serena Software, the company discussed in the second case study, Facebook was selected to create a stronger and more consistent corporate culture. In October 2007, Serena decided to start using Facebook. This was an excellent choice due to Facebook's dynamic, interesting and addictive characteristics. Facebook had the advantage of allowing users to maintain an extensive network of people, keep abreast of what they were doing, and to also update their network with their own activities. These attributes of Facebook would assist in developing a stronger sense of community within Serena. Many people did not know what many of their colleagues that they interacted with from other branches looked like. Serena held "Facebook Fridays" to make staff more comfortable with using Facebook. On the first Facebook Friday, all staff were encouraged to dress in outfits that depicted their personality, take photos of each other, and upload to their Facebook profile. Within 24 hours, more than half of Serena's employees had posted photographs of themselves to their Facebook profile. Serena used the public version of Facebook that was freely available for use. Workers privacy concerns were addressed by having teenagers, who were expert Facebook users, conduct training about Facebook's privacy tools and options available.

Status updates posted by people, helped colleagues who did not know each other well, to connect better, as they learnt more about each other. Due to the adoption of Facebook, Serena's staff were familiarised to Web 2.0 technology, and embraced a culture of openness and information sharing. Its Facebook presence caused customers, vendors, partners and future employees to easily learn more about Serena. Serena trusted their employees to use common sense on what they posted to Facebook.

Although participating in Facebook was voluntary, adoption was widespread with 90% of its employees having a Facebook profile within 2 months, and 75% of employees being active users visiting the site at least 3 times a week. Facebook was used successfully to market the company and to publicise and grow its social responsibility activities. Attendance at Serena' annual user conference doubled without the need to send out emails and make calls to customers and potential ties as it would have done previously. In addition, management used Facebook successfully to headhunt new employees and to network regularly with their peers in other companies.

Facebook has a few characteristics that make it an appropriate tool for the second ring of the bulls-eye which has a large number of weak ties. Facebook serves as a rich address book, as it enables a user to have thousands of contacts that are referred to as friends. A member can search for a specific friend, get contact data from the profile page of that friend, and post on the page of that friend. In addition, a member can post a status that will be seen by all his friends. Facebook also allows members to post photo, videos, and links to web pages, longer notes, and pointers to online content. Facebook allows a member to broadcast and thereby update all his friends on his activities. A member can receive multiple broadcasts listed in chronological order, and thereby keep informed of what all his friends are up to. Facebook requires little or no technical skills to post and receive updates, making it possible for members to build large social networks. Facebooks various privacy settings gives users control over what information they share, and who gets to see it.

Using Facebook within a company can blur the lines between personal and professional lives. This border will have to be negotiated and monitored as using SNS in enterprises become more popular. For Serena that grew by acquisition, and is widely distributed, most of their employees had weak ties to one another. To encourage employee participation, few communication rules were set, and employees were free to decide on their level of Facebook interaction. Serena's decision to use the social media platform of Facebook was spot-on as it led to strengthening of weak ties and developed a sense of community across the company.

Tools for converting Potential Ties: Intelligence Community' use of blogs and wikis

In the wake of the U.S. Intelligence community (IC) failing to prevent the 9/11 bombings, the IC launched the Galileo awards to promote new and innovative ideas. The first Galileo Award was won by Calvin Andrus, chief technology officer of the Centre for Mission Innovation at the CIA. His winning paper was titled "The Wiki and the Blog: Toward a Complex Adaptive Intelligence Community" and discussed how a robust and mature wiki and blog knowledge-sharing Web space, will change the nature of intelligence forever, allowing the IC to adapt rapidly to the dynamic national security environment by creating and sharing Web links and insights through wikis and blogs.

The IC already had existing networks with different levels of classification, which can only be accessed by users with the appropriate security clearances and suited to the use of ESSPs. By 2005, Google's search technology had been installed across all these networks. In 2005, Andrus and Dennehy, an FBI analyst, led the mission to test and deploy MediaWiki software across the IC and supported a single wiki that would be devoted to any and all topics of interest. Intellipedia, the ESSP that resulted from these interactions, was developed in-house due to security concerns, was introduced to the IC in April 2006.

The IC started using blogs across the community in March 2006. The use of Intellipedia led to new connections as Dennehy began to collaborate with Don Burke, who worked in the CIA's Directorate of Science and Technology. Despite both having worked for the CIA for a long time, and working in the same building, they had never met or knew of each other prior to using Intellipedia. The two were tasked with popularising the use of Intellipedia, as well as other ESSPs amongst the IC. They developed a five-day sabbatical program for analysts keen to learn and use the new technology.

The two stressed three core principles. The first principle being work at the broadest possible audience. This referred to the broadest network to which an individual has access. Sensitive information could be limited to basecamps and moving to restrictive space for sensitive information. Networks would be used to control access. Interested parties without access would know that more information exists and could begin following the trail. The second principle was that articles should be arranged as per topic, and not organisationally. This would result in

for example a single page on the Islamic State (IS), which everyone across the IC could contribute information on. The final principle was that the ESSP's should not result in more duties but should replace existing processes using these new tools. Instead of storing data on personal shared drives, folders and work documents, wikis can be used which has search capability. Blogs can be used to debate ideas, instead of emails being traded back and forth. Social tagging can be used instead of favourites using the browser. This was referred to as moving from channels to platforms, platforms being shared space that can be easily linked, searched, tagged etc. When a new analyst is looking for information about insurgency, he can easily find previous discussions and debates on the topic.

Eventually, in addition to blogs and Intellipedia, other ESSPs, were introduced across the IC, to share and comment on videos, photos, and for adding tags to online content. All software was developed in-house, due to the functionality and security requirements of the IC. Blogs have been an important ESSP for the IC as blogs have several characteristics that make them well suited to converting potential ties into actual ties. Firstly, Blogs are very easy to use, requiring little time and nearly no technical skill to create a new post. Blogs allow people to describe their work and can be seen globally instantaneously. Secondly, while blogs may seem to be a long page of posts, blogs are configured so that each update or post can be seen individually. This allows for easy linking to a specific post in someone else's blog, rather than linking to the entire blog. Blogs are permanently available over time, and can be still be found through searches, and links to blogs endure. Hence, blogs are a very suitable platform for workers to document their activities, including both the process and the end product of their work. Blogs can be used to express commentary, questions, opinions, etc. Tightly interlinked blogs make it easier for people to follow a thread or theme, and also easier for people to find what they are looking for because of the Google's page ranking algorithm.

Similarly, searching the intranet can also become effective and easy to use, provided that corporate intranets also become heavily interlinked and employ a similar search technology. Densely linked intranet will make it easier to find documents. The IC began building online social spaces like forums, blogs and wikis that allowed intelligence agents to post questions, queries, that would be answered by other agents, if only to point them in the right direction, so that they could find the documents or source that would help them to answer their questions. Quite often, the source turned out to be blogs or a wiki that contained updated, information

within the correct context. The ESSP was most valuable not for giving people access to information, but rather for connecting people to other people who possessed the information. These people would most likely have continued to remain isolated from one another. In a questionnaire sent out by McAfee to intelligence agents, the majority of agents emphasised the ability of the ESSP's to convert potential ties into actual ones, and the novelty and value of this ability (McAfee, 2009).

New Tools for Interactions between Strangers: Google and Prediction Markets

In the Google case study previously discussed, Bo Cowgill, an employee at Google, was interested in developing a prediction market within the company, but was unsure of how to continue, and whom he should work with on the project. He was inspired after reading The Wisdom of Crowds. Cowgill chose to post a message on Google's internal bulletin board and received a reply from Ilya Kirnos, within 10 hours and two other Google employees. The four formed a team. Another respondent was an associate of Hal Varian, a well-known economist who consulted at Google, who was also interested in prediction markets and whose advice was vital to the design of the market, how to implement them, and how to make them popular within the company. Once the design was completed, the team started programming, and had a working version of a prediction market in less than a month. They then sought formal support, and recognition from Google successfully and funding for the rewards.

During its first 3 months of operation, there were 24 questions being asked and 95 different answers. The questions are referred to as markets, and the answers as securities. The markets were based on events of interest. With the collection of data, the prediction markets team then started to analyse it, to determine whether the markets were accurate, and how well it could forecast what would actually take place. Cowgill compared the real-world outcomes to the predicted markets and found that final market prices were overall good probability estimates. Google's Prediction Markets illustrated the basic characteristic of markets, which is the ability to generate much treasured information by bringing together people who have little or nothing in common. The Austrian economist Frederich Hayek, in his seminal 1945 article titled "The Use of Knowledge in Society" focused on the value of markets to amass and convey valuable information in the form of prices.

McAfee advocates a fourth ring in the Enterprise 2.0 bull's-eye. This new fourth ring should be called "none", as the people within this ring may never form valuable ties, be it weak or strong ties. All the people in this ring, interact with one another in markets, and thereby generate valuable information in the form of prices. The traders in Internet prediction markets such as Iowa Electronic Market, Hollywood Stock Exchange have shown an ability to together generate accurate forecasts about a broad array of things. They all use technologies that have the attributes of an ESSP. Prediction markets are facilitated by self-interested individual activities that produce significant group-level benefits (McAfee, 2009).

Other Writers Views on Web 2.0

Sam Murugesan, a professor in the School of Computing and Mathematics from the University of Western Sydney in Australia, and an independent IT and education consultant, has views with concur with McAfee's beliefs on the significance of Web 2.0 on organisations. Murugesan notes "Web 2.0 harnesses the Web in a more interactive and collaborative manner, emphasizing peers' social interaction and collection intelligence and presents new opportunities for leveraging the Web and engaging its users more effectively" (Murugesan, 2007). Murugesan also notes "many enterprises are reaping significant benefits from Web 2.0" and that "Web 2.0 is an important phenomenon that shouldn't be ignored as hype or a passing fad" (2007). The McKinsey global survey revealed that three quarters of senior executives believed that Web 2.0 technologies are strategic and planned to increase their ventures in Web 2.0 applications (McKinsey Quarterly, June 2007). According to Kiryakova et al. (2011) "the new level of business is directly related to Web 2.0". Kiryakova et al., believes that the adoption of appropriate Web 2.0 tools is a necessity for the successful management of business. All of the writers above believe that Web 2.0 tools and technologies is not a hype or fad but will continue to have major impact on business and society.

Conclusion

McAfee's four-ring bull's-eye picture shows Enterprise 2.0 can be used successfully at any level of tie strength from situations with strong tie strength to non-existent tie strength. McAfee chose 4 case studies with different tie strength that were arranged by ring. In the centre, was VistaPrint that had colleagues that worked close together, and on the outermost ring, was

Google prediction market, where the users were untied traders. He deliberately arranged them this way, to show that the use of ESSPs differ by ring, with wikis being used by strongly tied colleagues, Social Networking Sites being used by weakly tied colleagues, and blogs being used to transform potential ties into actual ties, and prediction markets for people who no ties. However, McAfee goes on to say that these tools can also be used at other levels of the ring as well, for example, strongly tied colleagues, can trade in prediction markets, and the Intellipedia wiki developed for the Intelligence Community helped intelligence analysts change potential ties into actual ties. McAfee places the ESSPs at different levels of the ring, to show that they don't all do the same things or have the same effects when used within an organisation. Instead, ESSPs can be useful in different ways at each successive ring of the Enterprise 2.0 bull's eye.

Chapter 5:

The KM use-case for Web 2.0 tools within CoPs

Introduction

Historically, ICT technology of KMS, like email and intranets, supported the epistemology of possession approach, where knowledge is viewed as a cognitive resource, to be captured and shared amongst people (Schultz and Leidner, 2002). The knowledge in practice view espoused by Cook and Brown, as well as Newell, emphasises the importance of social collaborations, shared understanding, and attitudes that are necessary for knowledge to be created. CoPs are based on the epistemology of practice approach, which traditional ICT systems did not cater for. Traditional platforms and channels used to search for information and for communication purposes do not make it possible to see who accessed the information, and emails. The Davenport report (2005) showed that KM systems and groupware that was intended for collaboration, was not even listed amongst the popular tools used by people in organisations.

CoPs need assistance with infrastructure. KMS should include Web 2.0 technologies that support collaboration such as electronic discussion groups, electronic bulletin boards, Wikis, blogs, chat facilities, etc. Knowledge sharing can take place through the use of tools that support posting and responses to queries, sharing stories of individual experience, and the discussion and contesting of issues appropriate to the community. There are a variety of Web 2.0 tools that can be used to bridge the divide between different CoP networks, and thus span the holes that exist amongst networks, so that weak and potential ties can be exploited. Web 2.0 tools have been used very successfully by companies like VistaPrint, Serena, Google and the U.S. Intelligence community for creating a sense of community, sharing of information and collaboration and retaining knowledge of experienced employees. These are some of the many

benefits to using Web 2.0 tools that CoPs can also enjoy. The use of the Internet through networking technologies is vital for online communities to exist and function, as the web becomes the place where the community meets. The advantage of online communities is that knowledge is continuously being generated and looked at in different contexts (McLure Wasko, 2000). Collaboration between community members can also lead to innovative approaches to solve problems. An online system must be easy to use and be useful in order to encourage more people to use it.

Web 2.0 is all about communities, as it provides tools that encourage user participation as they create and share content and collaborate with each other. Web 2.0 tools allow users, who may be students, housewives, professionals, hobbyists, to produce content which could be in the form of a story, an experience, a song, a design, recipe, software, or some other item, and to share these products with a virtual community. People within a community may interact through dialogue, and share knowledge with each other, or collaborate and create new knowledge. Much knowledge can be gained through the participation of a large number of people, who can lend their own meanings to shared objects. This chapter aims to identify and examine some Web 2.0 tools and strategies that can be used to promote the creation, capture and sharing of knowledge within virtual communities. Thereafter, three case studies of virtual CoPs will be discussed to determine the use of online technologies, and how they impacted on these virtual CoPs.

The First Ring of the Bull's Eye - Strong Ties

The inner ring of Andrew McAfee's bull's-eye refers to strong ties that exist amongst the members within an organization, more often in the same location. Strong ties often exist amongst people that work closely together. The use of Web 2.0 technologies such as Wikis, Google docs, spreadsheets and presentations, and collaboration software such as MS Teams and Zoom are some popular applications that can be used amongst people that have strong ties within organisational CoPs. Wikis were used with great success within VistaPrint in order to document all the required standard operating procedures so that new recruits would become productive as soon as possible, and not cause any damage to software. This also ensured that knowledge was not lost when staff left VistaPrint (McAfee, 2009). Next, a review of some

popular ESSPs well suited for use within organisations where close ties exist amongst colleagues.

Wikis and other Collaborative Software

Ward Cunningham's software, MediaWiki, can be used within an organisation to create wikis for the sharing of information. MediaWiki is authoring software that allows one to write, edit and update articles. Employees can contribute in the form of an experience, fact, knowledge, insight, edit or link etc. Like VistaPrint, an administrator needs to be responsible to determine and setup the various topics that will be needed to cover the wide expanse of topics that would include amongst others, standard operating procedures, processes, and other knowledge that needs to be shared amongst employees. The wikis will be accurate, as employees detect and correct errors, and update changes within the workplace on an ongoing basis. Security can be built into the system, so that different levels of access can be provided to users based on their designations and responsibilities. Wikis were used successfully introduced to the U.S. Intelligence Community for collaboration and information sharing, after the IC failed to predict the 9/11 attacks (McAfee, 2009).

Chrysler's formation of technology clubs when the company changed from functional units to vehicle platforms was very successful for them, resulting in halved production times. The engineers within the technology clubs became responsible for keeping an Engineering Book of Knowledge, which is a database on compliance standards, supplier specifications and best practices. The use of Wikis to capture information by the various engineers and developers would be ideal, as it would provide the engineers and developers with the chance to contribute their knowledge, which would be reviewed by others within the company. This knowledge will also be built on and expanded by other specialists within the company. The use of Wikis to store procedures, compliance standards and other relevant knowledge, should be an option to be explored by companies. Employees have a vested interest to ensure that the knowledge within the wikis is accurate and up to date. Wikis would provide a means to transfer best practices amongst employees. The links provided within web pages of a wiki, provide structure for the Internet, and assists users to navigate the wikis and to find the required information. A common problem experienced by organisations, was that experienced staff that left the organisation, took their knowledge with them. The use of wikis, blogs, vlogs by employees, to

record or narrate their experiences, knowledge and best practices would assist in minimising effects of losing knowledgeable and skilled employees.

There has been a surge in the use of collaboration software due to the need for social distancing amongst people to prevent the spread of the Corona virus. It is being widely used within governments, businesses, and educational institutions, non-government organisations and by individuals. Collaborative software may be used amongst staff with strong ties that would previously see each other every day and may now be working from home. Collaborative software may also be used to facilitate meetings amongst members of emergent CoPs who would previously meet informally. Emergent CoPs that began though informal interactions within the same social group, share strong ties amongst its members and can also use ESSPs like Facebook and Instagram for members to keep in touch during this pandemic. Both Facebook and Instagram can be used amongst people that already have close ties, or amongst people with weak or no ties to strengthen or develop their network further. These 2 ESSPs will be discussed in more detail later.

Google's docs, spreadsheets and presentations enable colleagues to collaborate through sharing of files stored in the cloud. The links for sharing would only be sent to the relevant people. This allows various people to work on a single version of a file and prevents the problem of having many versions of the same file or document existing. Also, the files would be saved in a secure online location within the cloud, rather than within the devices of all the colleagues that contributed to that file. Another advantage is that people can work from any location, be it home, office, or at a different time and can access the file from the cloud. This reduces the need to save the file locally, and results in increased security of confidential files.

Software such as Zoom is freely available, and is used for teleconferencing, telecommuting, distance education and socialisation through a cloud-based peer-to-peer software (Zoom.us). Recently, however, security concerns have been raised with the use of Zoom. Another collaborative software is the Microsoft product Microsoft Teams (MS Teams). MS Teams provides high quality video and audio for web conferencing both internally and externally and is a popular choice amongst organisations that use the MS Office suite. MS Teams allows everyone to chat, meet, call and collaborate all in one place, no matter where they are

(www.microsoft.com). MS Teams prioritizes the privacy and security of all video-chats using their software. The organiser of the meeting sends out an invite to members containing a link to join the online meeting at the designated day and time.

The 2nd ring of the Bull's Eye – Weak Ties

The 2nd ring of the Bull's eye indicates the weak ties that exist between an employee and other colleagues, or between networks. These people are only acquaintances at best. They may have worked together on a project or been introduced through other professional acquaintances. There is no close relationship between these people. Mark Granovetter, in his article, "The Strength of Weak Ties" (1973) indicates the benefits that accrue from weak ties. Weak ties can bridge gaps between networks resulting in formation of new and novel ideas. Facebook is an ESSP that is ideal in bridging networks and strengthening weak ties. Facebook can build stronger ties between acquaintances to develop a sense of community, as in occurred in the case of Serena software. Tags and links are used widely by many ESSPs, including Facebook, Flickr, YouTube and Instagram. The use of tags allows structure to emerge over a period of time and has led to the development of algorithms, which can determine patterns and then make recommendations by extension. For example, based on consumers' purchases and / or queries, Amazon software will make suggestions to the consumer such as that if you like this book, then by extension you may also be interested in the following books as well.

Facebook

Facebook is a free social media application that allows registered users to create profiles, upload images and videos, and send messages and stay connected with friends, family members, co-workers and other relevant communities (www.facebookforparents.com). Facebook's Business page option has also been used by small business owners to promote their business and allows a business to connect with customers and thereby build a following. More customers, prospects, and friends of customers can be reached through Facebook than by other marketing channels. Facebook allows a user to increase their network of friends by recommending connecting with people with whom they have mutual friends. By sending out friend requests, and accepting friend requests received, a user's network can grow exponentially. Thus, Facebook provides a rich address book, with a maximum friend limit of

5000 with its free access. Business networks can grow rapidly even through just the free use of Facebook. Facebook can also be used by organisations to market company events and community initiatives through posting on Facebook. Management may also use the app to headhunt for new talent.

For organisations, that have grown rapidly, and are distributed over a wide geographical area, Facebook allows colleagues, who may only be acquaintances through work, to connect and become friends, and thus to develop a sense of belonging. This will assist to alleviate the impact of the politeness syndrome as described by Borthick and Jones (2000), where people are reluctant to be honest and constructive with each other, when they do not know each other well. A disadvantage of virtual communities, as opposed to communities that meet physically, is that it is much easier for a member to just disappear, as they don't have to face members physically within a venue. Also, cultural differences amongst individual members may hinder communication (Le Baron, Pulkkinnen and Scollen, 2000) and result in members taking longer to inculcate the culture of the community (Wenger, 1998). Hammond (1998) states that asynchronous discussions, which are independent of time and place, is advantageous, but has resulted in no urgency in responding. When members develop a sense of belonging, they are less likely to drop out of virtual communities. This sense of community may also help members to overcome communication problems and inculcate the culture of the CoP sooner.

Instagram

Instagram is another popular ESSP. Instagram is a simple, fun and creative way to capture, edit, and share photographs, videos and messages to friends and family (www.instagram.com). Instagram has proven to be an effective promotion tool and has emerged as the default place to get famous. Through ESSPs like Instagram, stories, pictures, videos can go viral overnight. Celebrities use Instagram to connect with and grow their fan base. Instagram works as an effective marketing strategy, with companies using it to showcase their latest products from their brands. New start-ups find it easier to obtain an audience through images posted on Instagram. Models and artists also showcase their work and build their fan base through Instagram. Instagram serves as an important platform for social media marketing.

Instagram has an appealing interface, is neat and organised. The platforms ability for users to organise their profiles, makes it highly popular amongst users to share photos despite the other photo sharing platforms available. Instagram has also become very popular with travellers, who want to share their travel photos. The geo-tagging feature allows users to add the location of their photos. This allows users to view all other pictures taken in the same location, provided that those pictures are available for public consumption. The use of tags makes it possible for users to easily find videos and photos. A new Instagram TV feature allows users to upload and share videos of any duration. These resources will be available on a 24/7 basis, accessible from any location, and secure, as it will only be accessible to members and their followers.

Privacy is extremely important to Instagram, as it does not allow pictures categorised as private to be shared by a member's followers. However, privacy settings are global for all of the resources shared by a member, as Instagram does not permit individualised security settings. In addition, Instagram does not allow downloading of pictures. Instagram also permits live streaming. Stories can only be shared for a day, after which the stories are no longer available. For those business users, who wish to have additional benefits, Instagram Business Profile accounts makes it easy for customers to contact a business through a contact button, which allows users the options of access to email, view the location of a business, or to call the business. In addition, business profiles with followers in excess of 10000 are allowed to have links embedded with stories, so that followers can be easily directed to another landing page (www.techuntold.com).

Unfortunately, Instagram is optimised for the application only, so the web version of Instagram does not match the application. Also, technical support is not good, as refreshing of the site does not occur, if problems are experienced when browsing the Instagram feed (www.techuntold.com). Overall, Instagram remains a good tool for sharing of videos and photographs privately and securely amongst a CoP network.

CoPs created within organisations, where members had weak ties and were nothing more than acquaintances due to working in different locations, have resulted in stronger ties due to collaboration. For example, at Hewlard Packard, product delivery consultants in North America, whose jobs entailed selling and installing software to reduce computer downtime being experienced by their clients, were isolated from one another. The KM consultants put

together a CoP, so that these product delivery consultants could meet once a month through a teleconference. The teleconference allowed consultants to learn from each other's experiences, thus making their work easier and more effective. Today collaborative tools like Ms Teams and Zoom may be used for participants of a CoP with weak ties to meet and collaborate within a virtual environment.

The Third Ring of the Bull's Eye – Potential Ties

The third ring of the Bull's Eye as described by McAfee, encapsulates the potential ties that exist within networks. Social networks without any ties whatsoever may be doing great work within the network, but because there is no interaction between the networks, no cross-pollination of knowledge will take place (Granovetter, 1973). Such was the case with the U.S. Intelligence community, resulting in dire consequences in 2001. Weak acquaintances can be used to bridge networks and turn potential ties into weak or strong ties.

The 911 Commission Report was really explicit about the failure on the part of the vast U.S. Intelligence community (IC) to connect the dots among the available pieces of intelligence leading up to the terrorist attacks of September 11, 2001. The intelligence agents' failure to share vital information with one another across the various agencies led to them being blind-sided and unaware of the looming 911 terrorist attacks. The vast array of potential ties available through the fifteen organisations that make up the U.S. Intelligence community was not utilised. Thereafter, the development and use of Intellipedia, which is the ICs equivalent to Wikipedia, to share information amongst agents within and across networks who may also be interested or working on similar cases, ensured that potential ties could be exploited. Thus, potential ties can become weak or strong ties. With Intellipedia, people who submit articles are given credit. This enables the community members to find out what others in the community are doing, and also who they are. This would not have been possible without the new ESSPs of Web 2.0. The technology of wikis that enables collaboration was used to develop Intellipedia. Wikis are a flexible tool that has been used to great success in organisations with both strong and weak ties, as demonstrated by VistaPrint and the U.S. IC respectively.

YouTube and the Transfer of Tacit knowledge

Newell (2002) states that some knowledge is not easy to express into written form, as is the case when tacit knowledge needs to be shared from expert to novice. Traditionally, the transfer of expertise from experts and mentors to apprentices or novices occurred within the confines of the workplace. However, when an organisation is widely distributed over a larger geographical area, as often occurs today, experts and novices may not always be located within the same area and workspace. The transfer of tacit knowledge is best done within a social context where the novice can view and listen to the expert demonstrating the task. Experts can reach a much larger audience by making videos available via a variety of channels. One of these being the hugely popular and widely used YouTube website. YouTube provides a platform where a user can find assistance on almost any topic independent of place and time. YouTube videos show up on Google's search engine and thus direct people to their site.

YouTube is an ESSP that allows the uploading of videos by contributors who register to have their own public or private channel or space on YouTube. These contributors who may be experts make and upload videos, allowing an online audience to follow, subscribe, and watch these videos. YouTube also employs links to navigate within the site and tags designed by contributors to generate traffic to their channel to watch their videos. Videos uploaded to a private channel can only be viewed by the followers that have been given the links to access those videos. This ensures that those videos are not available for viewing by the general public. A benefit of YouTube is that videos can be watched repeatedly if need be and are usually available for long-term use. Many people can view experts in YouTube videos simultaneously from anywhere in the world. The transfer of tacit knowledge can be independent of space and time as the physical presence of the expert is not necessary for transfer of tacit knowledge to occur. This can result in organisations having more novices trained within the same timeframe, than was possible previously. The use of YouTube has had a huge impact on education. Students from any field of study can search and watch videos from experts for free, in order to gain a better understanding of their subject content. There are videos on almost every conceivable subject available on the Internet. This has been a huge benefit for students and scholars during the Covid pandemic when they had to stay home during lockdown.

Video logs, commonly known as vlogs, have become very popular on YouTube. Contributors or YouTubers as they are now referred to earn income from YouTube, based on the amount of traffic that follow their channels and view the advertisements that appear in their videos.

Flickr

Flickr is another Enterprise 2.0 tool that allows contributors to upload photographs and videos that can be viewed by others for free. Contributors can either choose to have a free account with limitations on video size, and number of pictures allowed, or can choose a subscription with unlimited storage and video size of ten minutes in duration. Flickr allows contributors to create and make available stock photos, which can earn some revenue for them when downloaded by other people. Marsha Stevenson, a librarian at the University of Notre Dame, used Flickr successfully to gather a rich variety of tags from the various Flickr communities, to categorise the university's architecture slide collection.

Microblogging

Microblogging refers to a specific form of blogging that involves sending of small amount of content that can include limited text in the form of short messages, single image or video link. Popular microblogging services include Twitter, Tumblr, and FriendFeed. Twitter is a free and easy platform to use that allows one to post short messages of not more than 140 characters from computer, tablet, mobile phones or PDAs. Users will receive all messages from people that they are following in chronological order. An advantage of Twitter is that the writer of the tweet does not have to guess and send his message to people who might be interested in what he has to say. The message will be posted to a platform and will be consumed by followers in their own time. CoPs can use this service to inform members of articles and discussions in blogs or sites, and activities that may be of interest to them. Twitter can also be used to communicate with members of a CoP or organisation. Business icons like Elon Musk, Bill Gates use Twitter to communicate with followers and promote their ideas.

Online Bulletin Boards and Forums

Bulletin boards and forums are a wonderful way to build and grow a virtual CoP. However, the use of these tools is not limited to virtual CoPs and can also be used by emergent and managed CoPs, especially where the members cannot meet regularly, but need a way to interact, and benefit from the experience of other members. Online bulletin or message boards and forums are freely available for use for all communities. Quite often, the terms bulletin

board and online forum are used interchangeably, as they are very similar. The website forumotion refers to a message board as online support for Internet users (www.forumotion.com). An online forum is setup by an initiator to discuss a subject that he is passionate about. There are many online forums on the Internet for the various topics that people are interested in. Members have to register and login in order to contribute to the discussion on the forum. Discussions are based and structured on a topic, and members post responses to messages from other members on the topic. A Buckman Labs employee used an online forum to post a question requesting assistance to help a pulp mill client in Pacific North West and received several responses within the day from as far afield as Canada, Europe and South Africa. One of the responses received was successful in helping the pulp mill client to resolve the problem (Wenger, 2000).

With a bulletin or message board, the administrator will setup the board and post a question. Members must first join the community by registering and can thereafter post responses to the question raised. All messages in response to the question are arranged together in threads as per date. Both forums and bulletin boards have administrators that moderate the messages being posted to ensure quality of content, and to prevent flooding and spam. Forums may also have a more modern and sophisticated interface, rather than the basic appearance of bulletin boards. Bulletin boards are organised as per categories, with sub-forums and tags to allow for easy navigation by their members. The structure of the bulletin board is very important as it impacts the commitment of the community and promotes discussion amongst the community members. The website Forumotion offers free forums or bulletin boards and does not distinguish between the two. Forums and bulletin boards promote discussion within CoPs and can also encourage brainstorming within the CoP through the passionate engagement of members on a topic of mutual interest.

These threads are available permanently and can also show up in Google search results when one is querying a specific topic and trying to find a solution to a problem. Using the Google search engine would ensure that the results are listed as per Google's Page Ranking algorithm, with the results that were linked to or referenced the most appearing at the top of the hits. There is a greater probability of finding a solution sooner rather than later. Whilst conversations around the water cooler, will benefit those direct participants and their close ties, online

conversations on bulletin boards and forums will assist a global audience over a greater period of time, as these conversations will be available via the Internet permanently.

With CoPs, knowledge is owned and maintained by the community. With discussion boards, conversations are visible to all members of the online community and can be archived and accessed by other members (Sharatt and Usoro, 2003). Knowledge sharing allows the source of the knowledge to use the online community to effectively communicate what they know (Sharatt and Usoro, 2003). With virtual CoPs, knowledge stays relevant, as knowledge is continuously being regenerated and re-contextualised (McLure Wasko, 2000). At Lleida, the medical VCoP also included an e-forum that allowed the medical professionals to share topics of common interest to them. This also allowed some medical GP who might have been isolated, to collaborate and share knowledge with other professionals within their field.

Mashups

Application Program Interfaces (APIs) is a software development technology that allows for the creation of mashups. Google gave up control of Google Maps, to allow users to use their map data in different applications. This allows the development of many new applications. For example, an application that combines crime statistics with Google's map data, can show crime hotspots, and help people to stay away from those areas. Another application could combine property sales data with the map data to show suburbs in demand and average home prices and could thus assist prospective buyers in determining areas that would suit their needs. Flickr also allows access to their data, and as a result, applications can be built that can allow users to browse pictures by colour or by location. Users can also import data from Google Maps into their own website.

MySpace

MySpace was created as a social entertainment application and has been used for a long time to promote artists, music and bands, videos, movies and is host to many music communities. Users within a music community get to interact with other members, who have similar music taste, sharing their music, and compiling lists of their favourite groups etc. Some members of the MySpace community may use this space to contribute towards their work practices and activities. MySpace provides a venue for people to collaborate over their shared interest, be it music, movies, art or design or some other passion. New up and coming artists trying to break

into the music industry and get exposure and grow their fans have used MySpace with much success. Katy Perry, Sean Kingston and Soulja Boy are 3 artists among a long list that have used the MySpace to create virtual music communities of fans to promote their music (https://en.wikipedia.org/wiki/Myspace).

Google's search algorithm

The Forester survey indicated that people wanted better searching mechanisms, in order to find what they were looking for quickly within an organisation's intranet. Often organisations use their intranet to make available company policies, standard operating procedures, and other functional documents. Google's Page Ranking search algorithm could be employed to ensure that the most frequently used topics within an organisation's intranet would appear at the top of list of search results. This would assist employees to find relevant results quickly, and less likely to lead to frustration amongst employees, and may encourage greater use of the intranet amongst the employees if they find it to be easy to use and useful.

Blogs

A weblog, better known as a blog is a website that generally offers information, often with posts being in the style of a diary or journal. Posts are displayed in chronological order, with the most recent posts appearing first, followed by older posts. Initially, blogs were authored by individuals, but in the last decade, blogs often have multiple authors. Blogs from newspapers, universities, media outlets, think thanks and advocacy groups have increased, and account for much of the increase in blog traffic today. The word blog is also used as a verb, referring to maintenance and updating to a blog (https://en.m.wikipedia.org/wiki/Blog)

In the early 1990s, websites were generally created by people that were technology inclined or programmers, as it required knowledge of technologies like Hyper Text Markup Language (HTML), and File Transfer Protocols (FTP). Since the late 1990s, authors with little technical expertise can quickly start up a blog. There are many free websites such as WordPress, Joomla, and Blogger that allow authors to very quickly and easily create their own blogs. A small fee may be charged for the hosting of the blog. Blogs usually do not have a moderator and often serve to inform or persuade people, rather than ask for a response. However, these days, blogs allow readers to leave comments for the authors to react to. Authors can also

filter these comments, to remove hate and offensive speech. Blogs can be used to build a community, and to act as guide, provide a recognised message, or an official point of view. Blogs have allowed normal people, the majority of whom have no journalism skills, to become authors and to write for a broader audience. Publishing of blogs is immediate. (http://fhs.mcmaster.ca/OHPToolkit/Content/TK_BlogsVsBulletinBoards.pdf)

Both blogs and forums serve a purpose and can be used to inform and share knowledge within CoPs. Blogs may also be used to promote an organisation, product or service, whereas forums are more interactive, allowing for discussions to take place amongst members, who usually have a shared passion.

Really Simple Syndication

Really Simple Syndication (RSS) software uses the technical feature of signals and creates notices indicating whenever a website, blog or site with vlogs have been updated. Aggregator software from the user's device receives notices that updates to websites or channels that the user follows, have occurred. This makes it easier for users to view only the websites or channels that have been updated. This helps users to manage their time better, and to keep up-to-date with new posts in the websites, blogs and vlogs they follow. YouTube uses RSS software to create new notices so that their subscribers receive notices whenever channels they follow have new content posted. RSS feeds can help members of virtual CoPs know when blogs, wikis etc have been updated by fellow members, so that they can keep abreast of new information shared through those ESSPs.

The 4th Ring of the Bull's Eye – Non-Existent Ties

The 4th ring is on the outside of the Bull's Eye and depicts non-existent relationships or ties between people. The people within this ring may never form ties, be it strong or weak. People here interact with one another in prediction markets and generate valuable information. According to James Surowiecki in his book, The Wisdom of Crowds, the collective wisdom of many people is greater than the wisdom of any single individual. Surowiecki indicates that there are three conditions necessary for collective wisdom to occur, namely diversity of information, independence of decision, and decentralisation of organisation. In predictive

markets, each participant must possess varied information from others, and be able to make decisions independently. The nature of predictive markets is decentralisation, as many participants and not experts are making decisions at low level. Because of these reasons, predictive markets are generally a valuable source to capture collective wisdom and make accurate predictions, and as a result been used in many industries to make important decisions. These prediction markets have proven to be fairly accurate, as indicated by the success of the Iowa Electronic markets and the Hollywood Stock Exchange. There have been times of inaccurate forecasts as well, as in failing to predict the successful presidential victory of Donald Trump in 2016, and the decision of the majority of British citizens choosing to exit the European Union, also in 2016.

Microsoft and HP also use private prediction markets, for carrying out statistical forecasts. In 2005, Google announced that it has been making use of predictive markets to forecast product launch dates, opening of new offices and other items of strategic importance. Organisations have to develop their predictive market based on their requirements, using necessary expertise in the form of economists, relevant field expertise, information technology and statisticians. Surveymonkey is a site, where one can develop and launch free surveys, or alternatively subscribe to a premium account that allows greater functionality at a cost, to collect required data. The link to access a survey may then be easily and quickly distributed to an audience through platforms like Facebook, Instagram, discussion forums, email etc. Surveymonkey facilitates quick and easy development of surveys for people who have little or no expertise in the development of surveys.

Case Study 1: Medical VCoP in Lleida, Catalonia, Spain

The case study below shows the strength of weak or potential ties, as these medical professionals from the ancient city of Lleida, situated in the Province of Catalonia, Spain, were professional acquaintances who collaborated to review medical cases resulting in more accurate diagnosis and fewer referrals to the hospitals. The two virtual CoP (VCoP) systems designed for use by medical professionals encompassed several ESSPs like wikis, blogs, discussion forum, and online repositories.

General practitioners play a significant role in managing common diseases like diabetes and heart conditions. Despite clear communication between GPs and specialists being needed for enhanced management of these diseases, primary care professionals frequently experience professional isolation. They need to communicate with specialists at hospitals, in order to get advice and improve their clinical practice. In LLeida, Spain, two VCoPs were created to increase the interaction between general practitioners and nurses that were involved in primary care, and endocrinologists and pulmonologists who worked at the Hospital Arnau de Vilanova, to which patients were referred. The VCoPs named Endobloc and Pneumobloc were designed and developed using an existing Web 2.0 based virtual network that belonged to the local National Health System. The study concluded that the VCoPs resulted in better managed primary care, and reduced hospital referrals, as the general practitioners, were able to make more informed decisions, after e-consultations with the specialists from the hospital (Mauricio et al., 2016).

The system was designed to allow online interaction of the primary care physicians with the specialists. The system also allowed accessibility outside of working hours and the workplace, thus allowing professionals to share knowledge independent of space-time barrier. The VCoP offered 3 main Internet based functions namely, communication and interaction with peers, access to information, and joint work. Both VCoPs were identical, and had 7 components, namely: an E-Forum that allowed common interest topics, and virtual clinical sessions, an E-Consultation that allowed short clinical real case reports, together with questions and comments, an E-Blog that presented breaking news related to Health topics and the VCoP network, an e-Images repository that would store corresponding data to clinical reports such as X-Rays and scans, an e-Documents repository to store common documents, an e-Activities calendar that would reflect common agendas such as scientific events, workshops, seminars and an e-Wiki that allowed multiple people to author and share documents. Users were allowed to access and contribute to every component.

The pilot study showed very positive feedback with the majority of surveyed participants perceived the VCoPs to be useful, believing it to be a good model to be used in other primary care clinics and that it would be useful in other specialities. Thereafter, after minor changes, both VCoPs were launched. After 24 months, the final assessment showed that both VCoPs

enjoyed very similar activity with regards to visits and contributions, with activity being stable during the week, but dropping a great deal over the weekend.

The project highlighted that VCoPs can be used in real-life clinical practice. This was innovative, and a significant number of healthcare professionals participated, which enabled the sharing of content, and discovery of new knowledge through the use of social networks. The VCoPs have been highly effective in reducing professional isolation and facilitating interactive collaboration linked to improved health of the population, reduced medical costs, and fewer health disparities (Foy, 2010). This is largely due to interaction free of workspace and time constraints, and because health professionals share content openly, for all of them to benefit from it, resulting in new knowledge being created. In both VCoPs, active participation at 48% was higher than expected.

Case Study 2: University of Notre Dame, and its use of tagging and Flickr

The services being offered by Web 2.0 has common issues with libraries, such as copyright issues and the vast production and volume of information available on the Internet. David Seaman, executive director, for the Digital Library, stated that the core function of libraries today was to provide services, not access to library collections, as was its traditional function. The case study below examines how an architecture librarian at the University of Notre Dame used the Web 2.0 ESSP of Flickr and its communities to assist her with the task of labelling a large volume of architecture slides with very little original labels to describe them. The librarian used the virtual communities of Flickr, whom she had no close or weak ties with to get a rich variety of categories. She was able to exploit the potential ties that existed through Flickr communities, people who shared an interest in architecture or just recognised some of the pictures she posted in her collection.

At the University of Notre Dame, Marsha Stevenson, librarian for Architecture, was faced with the task of cataloguing three thousand digitised slides, whose labels contained minimal descriptions. She decided to post the entire collection on Flickr. She was surprised at the amount of attention the collection aroused in the Flickr community. Different Flickr communities started adding some of the Notre Dame slides into their collections and tagging

them. Flickr users provided a collection of notes and historical information and geographical tags. Stevenson's decision to trust the Flickr community resulted in a rich and varied collection of tags that far exceeded the minimal information from the slide labels (Bowman, 2008). Flickr provided a platform that allowed the community to access and use the Notre Dame Architecture collection, and to thereby add meaning as part of their practices. Through tagging Web 2.0 makes visible evidence of people's activity. Bowman, 2008, reveals that tagging enables the creation of services and access that improves with use.

Web2.0 makes evident activities of people, who are engaged in sharing information with others. It also creates space and functionality for creating objects of information that are clearly part of the practices and processes that people engage in. Tagging is everywhere on Web 2.0, and in essence tagging is making sense of things, as people attach labels to objects such as pictures, videos, places that have meaning for them. This labelling can be seen in context by other users and help to make evident their practices. Tagging gets better with scale, and results in natural categories being formed on the Internet. Scott Golder and Bernardo Huberman indicate that in a social bookmarking service such as del.icio.us, the frequency of any specific tag for a page occurring is a fixed proportion of the total frequency of tags, which means that even peculiar tags can co-exist with tags that have general meanings. Tagging becomes more efficient, as more people use it. Bowman (2008) notes that "Tagging works well because it recognises that people work in communities where other people are doing the same things, where information has the same meaning to other people too, and as long as one other person tags something the way you would, you'll find it, and it can be used." So, a user will find information that others have tagged, if he also uses the same tag to describe it. StumbleUpon is another social bookmarking service.

The 3rd circle of McAfee's Bull's eye reflects the strength of potential ties which is evident in this case study. Marsha Stevenson, the librarian, at Notre Dame University was able to assemble a rich variety of historical information and geographical tags about the architecture collection of slides due to the input of the many Flickr communities that included some of the Notre Dame slides that had meaning to them into their own collections and then tagged these slides. Stevenson did not know the members of the different Flickr communities that browsed through the Notre Dame University collection, found slides that were meaningful to them, and

created an array of tags around these slides. The use of Flickr exposed the Notre Dame Architecture slide collection to a global online community that may not have otherwise been exposed to this collection. It gave the Flickr community members an opportunity to include the slides as part of their practice.

Case Study 3: The Library and Art, Architecture and Design Students

Bowman (2008) had difficulty in locating literature on the needs and use of technology by arts, design and architecture students. This is possibly because these students create products like images and drawings that are graphical rather than textual. Web 2.0 is ideal for these students who deal in images and belong to close-knit communities of shared practice. Studies have shown that a primary need of these students was a need for images (Teague, 1987). Their need to be able to access images according to different categories and to browse was listed as very important. These students also built up their own extensive collections, as they believed that the library could not meet all of their specific needs (Bowman, 2008). Art, design and architecture students need access to a wide range of materials beyond the range of current art libraries. They also needed information on the local and current art scene, as well as an awareness of trends. These students also need their own work to be documented and recognised.

“The real ingenious thing is the way in which Web 2.0 services lend functionality to the way users connect, both to information and to each other. By focusing on the connecting abilities of the network, the web becomes not about providing access, but about providing service. The heart of Web 2.0 is that it allows one to tap into a community” (Bowman, 2008). Thus Web 2.0 identifies clearly what people are doing, constructing, making, or building (Bowman, 2008). The various services of Web 2.0 add immense value as they are all combined parts of a community of practice, of practice and sharing. A production technology like blogs adds value, as it shows students how to become producers of content. Web services like Flickr and MySpace are most suited to the creative process, as they allow users to create and share meanings (Bowman, 2008). Librarians can help students to create virtual communities and to encourage dialog within these communities. Students can express themselves, collaborate and

share resources as Web 2.0 allows librarians and educators to take part in the daily activities of students. Art, design and architecture students have the opportunity through communities set up on Flickr and MySpace to share their personal collections, publish their research, and to make meaningful contributions to their communities. MySpace gives these students the space to be productive, share ideas and the results of their creativity, as well as document their work, and help to provide the information resources that their community needs (Bowman, 2008). Librarians should take advantage of these online tools that match the needs of these art, design and architecture students, in order to provide the information resources needed by these students, whose needs change as they progress creatively as students. This will enable the art library to stay relevant.

Archinect is an online community made up of designers and architects, and also includes a school blog project that allows students from various institutions to use the Web 2.0 authoring tool of blogs to write about their experience as students. Individually, these blogs would not have much value, but as a collective within the Archinect community, these students grow creatively, as they engage in dialogue and discuss their experience and work with working designers and architects, and thus also improve their information literacy (Bowman, 2008).

Conclusion

The strength of weak ties, as described by Mark Granovetter in the article of the same name, cannot be overemphasised. Weak ties may bridge the gaps between networks. This can lead to the development of new and novel ideas that can benefit both networks. ESSP's like Facebook, Twitter, Instagram, MySpace with their huge user bases, allow people to easily make new contacts through recommendations of new friends and new communities to join, and thereby bridge the gaps between different networks. The mechanisms of collaborative problem solving, joint decision-making and collaborative creation of documents leads to knowledge discovery (Becerra-Fernandez, 2004). Using weak acquaintances to bridge networks, can lead to greater collaboration taking place between networks. Web 2.0 tools have allowed tacit and explicit knowledge to be shared by its authors across networks that may span groups and organisations. Knowledge have been captured using a variety of Web 2.0 tools such as blogs, vlogs, discussion forums, Wikis and appears on Internet sites such as YouTube, Instagram, Twitter, Facebook, Wikipedia etc.

The Bull's eye analogy was used to examine the four types of ties that exist between members within organisations or CoPs. Several ESSPs were examined, with consideration being given to their features, use of Web 2.0 technologies, their use within organisations and CoPs and how CoPs have benefited from their adoption. It is evident that ESSPs are quite flexible and versatile. For example, Wiki technology have been used with great effect in both organisations with strong ties like VistaPrint, as well as in organisation with weak ties like the U.S. Intelligence Community. Similarly, Facebook may be used within an organisation to strengthen relationships and build community spirit, or to create bridges between networks using weak acquaintances.

Chapter 6:

Conclusion

Web 2.0 provides spaces for people to gather and meet virtually. Web 2.0 provides several advantages to the software industry, because it is completely online. There is no scheduled release for software upgrades and fixes, no sale and licensing of software, and no need to port software for clients to run on different platforms. As a result, there are no additional investments in hardware, software or maintenance. This will result in lower development and deployment costs. Users only need access to the Internet, as Web 2.0 allows remote access to its software and services. Service providers can focus on the Internet to improve their technologies and service to users. Web 2.0 tools are easy to use and don't require users to have any special training. Users can customise and use these technologies within a local context if required. Web 2.0 creates their own content, but also guides and improves value to content produced by users within their communities. Creators of videos posted onto YouTube have to abide by the strict rules regarding copyright, unnecessary violence for example, or risk their videos being removed. Web 2.0 gives people the opportunity to take global information and apply to local social contexts to create information within a locally meaningful manner but has global access. Organisations can feel a loss of control, as sharing content gives more control to users, and Web 2.0 tools and technologies are controlled by service providers through cloud computing.

Knowledge sharing occurs when recipients comprehend the knowledge, take decisions and act on the knowledge received (Jensen and Meckling, 1996). The capture and sharing of knowledge through the use of Wikis makes it easier for existing standards, procedures, and processes within the organisation to be shared. This will benefit new staff members to become productive more quickly. The quick access to available information may also assist people to perform better in their jobs. Even if an organisation changes its environment, the body of knowledge will remain current as employees continue to update wikis. In addition, innovations and insights, which previously have been difficult to share widely due to the limitations of the platforms and channels available then, can now be much more quickly and widely shared with

aid of the various Enterprise 2.0 tools available. Employees can also receive credit for their contributions, as the entries in blogs and discussion forums make visible the names, dates and often times of contributors. People respond to problems or questions posed in forums, with suggestions based on their experience. This can lead to quick solutions for others, with no need to reinvent the wheel.

Authoring tools transform the intranet within an organisation, so that it becomes continually updated, entwined work of many people rather than a few. Employees are more likely to take ownership of the intranet, and this will lead to greater use of the intranet. Blogs and Wikis have encouraged people to write for a broad audience. Wikis contain links, tags and formatted content, making wikis easier to read, navigate, and be found by search engines like Google. Blogs with multiple authors may be used for carrying out constructive debates. The use of wikis and blogs have made it possible to learn who is working or have worked on similar problems, investigations, projects, or research within an organisation, or related networks. Such is the case with the U.S. Intelligence community today. This makes it possible for an agent, to find out and then establish contact with other agents across the Intelligence community for the purpose of sharing information and possible assistance. Existing knowledge can be looked at in a new configuration or new context to create new explicit knowledge (Becerra-Fernandez, 2004). Google's search technologies can also be installed within organisations intranets to make searching for information easier. In 2005, the U.S. Intelligence community installed Google's search technology across all their networks, to expedite the efficient searching and finding of relevant information timeously.

Technology can also be used to measure the effectiveness of CoPs. The value of CoPs can be determined through the anecdotal stories told by its members. Stories need to be collected in a systematic manner, so as to be a true representation of the diversity and range of community activities. At Shell, stories from CoP members were published in newsletters and reports. At American Management Systems (AMS), an annual competition is held to collect the best stories. The stories were then analysed to determine the savings made to the company and impact on revenue (Wenger, 2000). The use of Web 2.0 tools such as blogs, vlogs and wikis can be employed to capture and share the stories from community members. In addition, a

prediction market could be designed, and used within the company to gleam the effectiveness and value of the different anecdotal stories from community members.

The relaxed and informal nature of CoPs lends itself well to the use of social media platforms. The use of social media apps is addictive and may stimulate less-active members of the CoP, to become more active participants. The wide reach of ESSPs allows for easy global connections despite differences in culture and geography. CoP size is not limited by size of a physical venue and virtual CoPs may be unlimited in membership. Through the use of social media platforms CoPs can also help organisations to recruit new talent through networking. The output and practice of knowledge workers and VCoPs is generally visible through the new platforms. Web 2.0 is all about communities. It's not what you know, but rather whom you know, as a person's associations, impact and knowledge shared by those associations affects a person's own knowledge. The gaps across CoPs and networks can be bridged through weak and potential acquaintances. The various ESSPs available through Web 2.0 are being used by many organisations to strengthen their communities, expand their business and networks through collaboration and sharing of information. Potential ties can also be converted into acquaintances through ESSPs like Facebook, MySpace, and Instagram etc. Even where no ties exist between people, collective intelligence can be gathered through prediction markets.

The advent of Web 2.0 and its technologies have changed the world forever. The web is no longer static and simply the domain of companies and technical savvy people to create websites and content. Anyone and everyone have the opportunity to be an author and create their own content. The Web encourages user participation in almost all aspects of life, be it listening to music, reading a book, watching a movie, doing shopping and banking, finding directions, how to cook your favourite meal, or to making friends and even finding your life partner.

Since Web 2.0, communities have sprung up all over, be it an VCoP that provides support to people suffering from an ailment, or a VCoP for people within the same profession sharing information and experiences, or a VCoP within a local school, campus or within a small or widely distributed organisation. People have learnt the benefits of interacting and sharing information. For businesses, the judicious use of technologies like wikis and blogs has resulted in the capture of knowledge which otherwise may have been lost, when experienced employees

retired or resigned from their jobs. Web 2.0 tools have resulted in organisations saving money, increasing their profits through new products, services and customers. In addition to the wide variety of Web 2.0 applications currently available, companies are creating new and more innovative services that are free online.

Web 2.0 tools have already resulted in the development of Learning Management Systems (LMS) such as Moodle and Blackboard that are used widely in higher education institutions. These LMS have allowed universities to make a lot of their teaching content available online for their students to access. The advent of Covid pandemic has seen an increased use of the LMS by educational institutions all over the world, as society seeks to educate its future workforce, while staying safe by practising social distancing. In addition, websites like Coursera have been offering entire courses online, reaching out to a global audience for enrolment in courses offered by universities worldwide. The world through the Internet and its technologies are moving very firmly towards E-learning. Universities as we traditionally view them, are changing to the point that in the future, limitations on enrolment based on constraints imposed by venue size will no longer apply as the entire student body will no longer be on campus, sitting in venues and attending face-to-face lectures. The Internet and Web 2.0 has changed the world that we grew up in, it will never be the same again, nor is there any going back.

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